

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF PENNSYLVANIA**

JILL STEIN, et al.,	:	
	:	CIVIL ACTION
Plaintiffs,	:	
v.	:	No. 16-cv-6287(PD)
KATHY BOOCKVAR, in her official capacity as Secretary of the Commonwealth, and	:	
JONATHAN MARKS, in his official capacity as Commissioner of the Bureau of Commissions, Elections and Legislation,	:	
Defendants.	:	
	:	

DEFENDANTS' AND INTERVENORS' PROPOSED FINDINGS OF FACT

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I. Background of the Litigation

1. Plaintiffs filed this lawsuit on December 5, 2016, nearly a month after the November 8, 2016 Presidential Election. DX A.

2. Along with a recount of the 2016 election results, Plaintiffs sought to compel Pennsylvania to eliminate Direct Recording Electronic (“DRE”) machines and introduce voting systems with a voter-verifiable paper trail. DX A; Am. Comp., ECF 71; Feb. 18, 2020 Tr. at 210:16-18 (Gates); Feb. 19, 2020 Tr. at 55:22-56:17 (Halderman).

3. DREs are electronic voting machines on which the vote is registered and directly recorded electronically. Feb. 18, 2020 Tr. at 62:21-63:1 (Boockvar); Feb. 18, 2020 Tr. at 187:21-188:4 (Gates). When a DRE is in use, “the official vote of record is an electronic capture of the vote.” Feb. 18, 2020 Tr. at 63:1-2 (Boockvar).

4. In 2016, the overwhelming majority of Pennsylvania counties were using DRE voting machines. Feb. 18, 2020 Tr. at 62:16-21 (Boockvar).

5. The first paragraph of Plaintiffs’ Complaint identified their central objection to DRE voting systems: “Voters are forced to use vulnerable, hackable, antiquated technology... *There is no paper trail.*” DX A, Complaint, ¶ 1 (emphasis added); *see also id.* ¶ 15 (“DRE machines in Pennsylvania do not leave a paper trail accessible to voters or to anyone else. Voters touch boxes on a screen, get no paper confirmation of their vote, and hope their votes were counted accurately.”); *id.* ¶ 21 (“[F]or counties that use DRE machines, there is no paper ballot. It is impossible for voters to verify even a single DRE vote on a piece of paper.”).)

6. This Court denied Plaintiffs’ request for preliminary injunctive relief on December 12, 2016, after holding an evidentiary hearing, at which Plaintiffs presented expert testimony from J. Alex Halderman on the issue of voting machine security. Feb. 19, 2020 Tr. at 55:5-7 (Halderman). The Court denied Plaintiffs’ preliminary injunction motion on multiple

independent grounds. First, the Court found that Plaintiffs lacked standing. ECF 55, at 13-14. Second, it held that the doctrine of laches provided grounds to deny the relief Plaintiffs sought. Plaintiffs had “inexcusably waited well past the eleventh hour to seek [injunctive relief].” *Id.* at 21. Third, the Court held Plaintiffs were unlikely to prevail on the merits of their claims (*id.* at 22-24) and had failed to show irreparable harm. Despite their allegations, “Plaintiffs had presented no credible evidence … that any … tampering [with Pennsylvania vote totals] occurred or could occur.” *Id.* at 25. Even if it credited all of Plaintiffs’ experts’ opinions, the Court noted, “they [would] make out little more than the theoretical possibility a voting machine somewhere in the Commonwealth might be susceptible to tampering.” *Id.* at 29. “Plaintiffs have raised only spectral fears that machines were hacked or votes miscounted [S]uspicion of a ‘hacked’ Pennsylvania election borders on the irrational.” *Id.* at 30, 31.

7. Plaintiffs filed an Amended Complaint on February 24, 2017. Am. Comp., ECF 71.

8. The Amended Complaint alleged that the vast majority of Pennsylvania voters “vote on DRE machines *with no paper trail*,” which “give voters no way to ensure that their intended choices were accurately recorded by the machine, and no way for election officials to verify those choices in the case of a recount.” Am. Compl. ¶¶ 24-25 (emphasis added). Plaintiffs alleged that the fact that votes are recorded solely in digital, electronic form, with no paper record, makes paperless DREs uniquely vulnerable to malicious attack. Am. Compl. ¶¶ 26-29. According to Plaintiffs, “*paper* ballots are the best and most secure technology available for casting votes” because “[p]aper cannot be hacked.” *Id.* ¶ 31 (emphasis in original). “In all of the DRE counties, there is a total lack of a voter-verifiable paper trial. Voters in these

counties can do nothing on Election Day to verify that their votes were counted.” *Id.* ¶ 119.c. Moreover, Plaintiffs complained, recounts and recanvasses of votes recorded by paperless DRE machines “reveal nothing” because “they [are] simply reviews of images retrieved from the same machines that [purportedly] might have been hacked.” ECF 98, at 7 (citing Am. Compl. ¶ 56).

9. On November 28, 2018, the parties entered into a Settlement Agreement, which is discussed in more detail below. JX 30.

II. The Commonwealth’s Initiative to Phase Out DREs and Require Voting Systems with Voter-Verifiable Paper Records

A. The Department of State’s Decision to Upgrade Pennsylvania’s Voting Technology

1. The Emerging National Consensus on the Need for Paper-Based Voting Systems

10. Since the 2016 election, a national movement, based on expert analysis of election security principles, has developed in favor of voting systems that produce a voter-verifiable paper record that can be audited. Feb. 18, 2020 Tr. at 86:8-24 (Boockvar); JX 13; DX F.

11. National experts have concluded that it is important for voting systems to produce paper records in order to allow voters to verify that their vote has been recorded accurately and to enable robust post-election audits. Feb. 18, 2020 Tr. at 84:15-85:5 (Boockvar); JX 13 at 1; JX 13 at 1-2, DX F.

2. The Department of State Formulates New Standards for Pennsylvania Voting Technology

12. At the end of 2017, the Pennsylvania Department of State (the “Department”) decided that it was necessary to replace the outdated voting systems used throughout Pennsylvania with new voting systems that employ a voter-verifiable paper record. Feb. 18,

2020 Tr. at 61:23-62:15 (Boockvar); JX 1; JX 2; JX 4; JX 5. By March of 2018, Secretary Boockvar was leading this initiative. Feb. 18, 2020 Tr. at 68:9-69:7 (Boockvar).

13. The Department's initiative was an effort to move the Commonwealth to the next generation of voting security. It sought to ensure, among other things, resiliency, auditability, and security of the new voting machines introduced for use in Pennsylvania. JX 1; JX 18; Feb. 18, 2020 Tr. at 64:15-65:20; 96:20-97:1 (Boockvar).

14. Under the initiative, the Secretary would refuse to consider for certification, or to certify, DRE voting systems. Feb. 18, 2020 Tr. at 63:5-7 (Boockvar).

3. The Commonwealth's Extensive Communications to the Public and Pennsylvania Counties About the New Voter-Verifiable Paper Requirement

15. From the initiative's inception, the Commonwealth provided detailed information to the counties and to the public about the initiative on a regular basis. *See, e.g.*, JX 13 at 3; JX 12.

16. Representatives from the Department, including the Secretary, engaged in frequent conversation with the counties about the initiative, detailing the characteristics of the voting machines that would be certified and the timeline of the transition as it developed. Feb. 18, 2020 Tr. at 67:25-69:3 (Boockvar); JX 13 at 3 (“Over the last 10 months, the Department has visited dozens of counties, spoken at several county government conferences, provided feedback on proposals, suggested timelines for implementation, recommendations for negotiation of terms, and much more.”).

17. On February 9, 2018, the Department issued a directive informing the counties that “all voting systems purchased **on or after February 9, 2018** must be of the type that

employs a voter-verifiable paper ballot or a voter-verifiable paper record of the votes cast by a voter.” JX 1 (emphasis in original); Fact. Stip. ¶ 1; Feb. 18, 2020 Tr. at 64:2-23 (Boockvar).

18. On February 9, 2018, Pennsylvania Governor Tom Wolf issued a press release explaining that as counties “prepar[ed] to replace their aging voting equipment,” the Department’s contemporaneous directive to the counties “ensures those new modern machines will include a paper record.” Fact. Stip. ¶ 2; JX 2.

19. On April 2, 2018, the Department issued a press release announcing that it was “tak[ing] the next step toward modernizing Pennsylvania’s elections” by issuing an Invitation for Bid (“IFB”) with updated requirements designed to promote resiliency, security, and auditability of voting systems. Fact. Stip. ¶ 4; JX 4. The press release announced that current voting system contracts would not be renewed and that new contracts must conform to the standards set out in the new IFB. *Id.*

20. On April 12, 2018, Commissioner Jonathan Marks sent an email to county election directors attaching a press release dated April 12, 2018 which informed the counties that they must have voter-verifiable paper record voting systems selected by December 31, 2019, and preferably in place by the November 2019 general election. JX 5. The email informed counties that Pennsylvania had received federal funds to assist the counties in this transition, and announced a public vendor demonstration to take place on April 26, 2018. Fact. Stip. ¶ 5; JX 5; Feb. 18, 2020 Tr. at 66:5-67:12 (Boockvar).

21. The Department held a public vendor demonstration on April 26, 2018 at which five voting systems vendors – Dominion, Election Systems & Software (“ES&S”), Hart, Unisyn,

and Clearballot – presented voting systems to government officials, the public, and the media. JX 5; Feb. 18, 2020 Tr. at 67:7-21; Feb. 18, 2020 Tr. at 63:17-22 (Boockvar).

22. On June 12, 2018, the Department issued a “Directive Concerning the Conduct of Electronic Voting System Examinations by the Commonwealth of Pennsylvania Issued by the Secretary of the Commonwealth.” Fact. Stip. ¶ 8. This document lays out new voting system security standards for certification for vendors. Feb. 18, 2020 Tr. at 73:1-11 (Boockvar). Under these standards, voting systems purchased in Pennsylvania on or after February 9, 2018 would have to: “be of the type that employs a voter-verifiable paper ballot or a voter-verifiable paper record of the votes cast by a voter”; “provide a mechanism for the voter to validate the contents of the ballot before it is cast irrespective of the mechanism used for casting the vote,”; and “support a voter verified paper ballot or voter verifiable paper record which can be used by election officials to verify the election results.” JX 7, Attachment E at 2, 5; Feb. 18, 2020 Tr. at 74:4-75:10 (Boockvar). This document was posted publicly on the Department’s website and provided via email to the counties, vendors, and other stakeholders. Feb. 18, 2020 Tr. at 72:12-18 (Boockvar).

23. On September 25, 2018 Deputy Secretary Jonathan Marks, then the Commissioner of the Department’s Bureau of Commissioners, Elections and Legislation, testified at a public Pennsylvania Senate State Government Committee hearing. Fact. Stip. ¶ 15; JX 13. Deputy Marks provided background information about the national movement to transition to a new generation of voting systems, and in particular, the national pressure on states “to replace older voting machines with voting systems that produce a paper record that voters can verify, and which enable robust post-election audits.” JX 13 at 1. He explained that

“Pennsylvania is one of only a handful of states remaining that use all or primarily paperless voting systems” and summarized the Department’s initiative and efforts that were being made by the state and the counties to achieve this transition. JX 13 at 2-6. Deputy Marks recounted that the Department had directed that “Pennsylvania counties must select new voting systems that meet these standards by December 31, 2019,” and “urg[ed] the counties to implement these new voting systems as soon as feasible and no later than the 2020 Primary Election.” JX 13 at 2.

24. In this written testimony, Deputy Marks cited the recommendation from a report authored by the National Academies of Sciences, Engineering, and Medicine entitled Securing the Vote: Protecting American Democracy (“Securing the Vote Report”), that “all elections should be conducted with paper ballots by 2020.” JX 13 at 2; DX F (Securing the Vote Report excerpt).

25. The term “paper ballot” is defined in the Securing the Vote Report as “original records that are produced by hand or a ballot-marking device, which are human-readable in a manner that is easily accessible for inspection and review by the voter without any computer intermediary (i.e. voter verifiable), countable by machine (such as a scanner) or by hand, and which may be recounted or audited by manual examination of the human-readable portion of the ballot. A paper ballot-based voting system makes the paper ballot the official ‘ballot of record’ of the voter’s expressed intentions...The human-readable portion of the cast paper ballot provides the basis for audits and recounts.” DX F at 42-43; Feb. 18, 2020 Tr. at 89:5-90:4 (Boockvar).

26. The definition of “paper ballot” in the Securing the Vote Report is consistent with the Department’s understanding and use of the term “paper ballot” in the course of its initiative. Feb. 18, 2020 Tr. at 90:5-91:1 (Boockvar).

27. In its communications about its initiative, the Department used the terms “voter-verifiable paper ballot” and “voter-verifiable paper record” interchangeably to refer to the piece of paper that is produced in hand-marked paper ballot voting systems and ballot-marking device systems, which includes a record of the voter’s selection in human-readable text and is considered to be the official vote of record. Feb. 18, 2020 Tr. at 64:24-65:6, 69:22-70:1, 75:7-19, 91:2-17, 96:8-12, 136:2-137:3, 138:23-139:10, 139:21-140:18 (Boockvar), 181:7-13 (Gates); Feb. 19, 2020 Tr. at 238:18-239:16 (Baumert).

28. The Department’s interchangeable use of the terms “paper ballot” and “paper record” was consistent with the practice of the voting technology industry, which often uses the terms “paper ballot,” “vote summary card,” and “cast vote record,” interchangeably. Feb. 19, 2020 Tr. at 253:5-254:16 (Baumert).

B. The Department’s Certification of New Paper-Based Voting Systems

1. Overview of the Certification Process

29. The Secretary of the Commonwealth is responsible for examining voting machines and approving them for use in Pennsylvania. 25 P.S. § 2621(b); Feb. 18, 2020 Tr. at 11:18-23 (Boockvar).

30. The Secretary employs an extensive and rigorous certification process that includes security testing. JX 7; JX 34; Feb. 18, 2020 Tr. at 72:5-72:11 (Boockvar); Feb. 19, 2020 Tr. at 94:8-10 (Halderman).

31. In order to be certified for use in the Commonwealth, a voting system must be certified by the U.S. Election Assistance Commission (“EAC”) and by the Secretary. 25 P.S. § 3006(c); 25 P.S. § 3031.5(a); Feb. 18, 2020 Tr. at 32:14-16, 71:22-25, 104:17-18 (Boockvar); Feb. 19, 2020 Tr. at 93:25-94:4 (Halderman), 222:1-9 (Baumert). *See, e.g.*, JX 8; JX 28. The EAC is the federal agency that certifies voting systems. Feb. 18, 2020 Tr. at 32:11-14 (Boockvar).

32. The Secretary’s determinations about which voting machines to approve or disapprove must be made “in accordance with the provisions of [the Election Code],” and “the requirements of section 301 of the Help America Vote Act of 2002 [*see* 52 U.S.C.A. § 21081]” (“HAVA”). *Id.* In order to merit approval for use in the Commonwealth, an electronic voting system and its components must satisfy seventeen specific requirements. *See* 25 P.S. § 3031.7 (listing requirements relating to, *inter alia*, ballot components, privacy, security, quality, and accuracy). HAVA adds more than a dozen additional requirements. 52 U.S.C.A. § 21081(a).

33. The testing process includes a functional examination, a security/penetration analysis, a privacy analysis, a usability analysis, an accessibility examination, and security testing. JX 34. The functionality examination occurs on-site at the Department and typically takes several days. Feb. 18, 2020 Tr. at 261:1-19 (Kotula). This examination is open to the public. Feb. 18, 2020 Tr. at 261:20-21 (Kotula).

34. No voting system is entirely free from vulnerabilities, and the Secretary must determine what calculated risks are appropriate in carrying out her duty of evaluating and certifying voting systems. Feb. 18, 2020 Tr. at 76:1-77:3 (Boockvar); *Banfield v. Cortes*, 110

A.3d 155, 174 (2015) (“[A]ll voting systems are imperfect and not immune from tampering, [and] the Election Code cannot be read to impose a requirement that cannot be achieved.”)

35. Counties choose a voting system from among the voting systems the Secretary has certified. Feb. 18, 2020 Tr. at 123:21-124:2 (Boockvar).

36. The Department does not have the authority to mandate that counties purchase particular voting systems. Feb. 18, 2020 Tr. at 123:21-23 (Boockvar).

37. The Department periodically published “Pennsylvania Voting System & Electronic Poll Book Reports” (“certification status reports”) that identified all the voting systems (by manufacturer and model number) that were under review for certification, which stage of the examination process each system had achieved, and the dates on which examinations were scheduled to take place. Feb. 18, 2020 Tr. at 77:14-82:25 (Boockvar), 285:11-22 (Kotula); JX 12; DX M; DX S; DX T; DX U. These reports provided links to further information about each of the systems under review. JX 12; DX M; DX S; DX T; DX U. The Department posted these reports on its website and distributed them to counties and other stakeholders. Feb. 18, 2020 Tr. at 78:3-7 (Boockvar).

2. The Department’s Well-Publicized Efforts in 2018 to Examine and Test Voting Systems for Compliance with Its New Requirements

(a) Types of Voting Technology That Meet the Department’s New Requirements

38. Under the Department’s initiative, the types of voting machine systems currently on the market that qualify for certification include: “hand-marked paper ballot systems” in which a hand-marked ballot is fed into a scanner for tabulation, and ballot-marking devices (“BMDs”), which “[] use a machine to print a paper, [which] is the official vote of record,” and which is

then fed (either automatically or manually) into a scanner for tabulation. Feb. 18, 2020 Tr. at 63:7-16 (Boockvar).

39. HAVA requires that if a polling location uses hand-marked paper ballots, a BMD must also be available to ensure accessibility to people with disabilities. Feb. 18, 2020 Tr. at 122:11-15 (Boockvar).

40. In some BMD systems, the printed, completed paper ballot is scanned into a separate scanner/tabulator for tabulation. Feb. 19, 2020 Tr. at 186:22-25 (Halderman). Other BMD systems, including the ExpressVote XL, are referred to as “hybrid” systems because they are constructed as a single machine that has both ballot-marking functionality and scanning/tabulating functionality. Feb. 19, 2020 Tr. at 119:23-120:12, 157:18-23 (Halderman), 186:22-187:6 (Baumert); JX 8 at 2.

41. Certain voting technology manufacturers are still producing DREs, some of which have a voter-verifiable paper audit trail (“VVPAT”). A DRE with a VVPAT produces a paper receipt reflecting the votes. Feb. 18, 2020 Tr. at 107:20-108:10 (Boockvar); Feb. 18, 2020 Tr. at 187:21-188:14 (Baumert). A DRE with a VVPAT does not record votes by scanning and tabulating the paper receipt; rather, it records the votes directly in the permanent memory of the machine, as a regular DRE does. Feb. 19, 2020 Tr. at 8:20-25, 10:16-19 (Halderman), 187:22-188:14 (Baumert).

42. As part of its initiative, the Department has informed manufacturers that it will not examine or certify DREs, including DREs with VVPATs. JX 4; Feb. 18, 2020 Tr. at 63:5-13 (Boockvar).

(b) The Department's Examination and Certification of the ExpressVote XL and Other Systems

43. In 2018; the Department began efforts to examine a number of new systems for certification. *See JX 12.* Since January 1, 2018, the Department has certified eight voting systems. Fact. Stip. ¶ 7.

44. Each of the systems that the Department has certified constitutes a “suite” of voting systems that includes a number of different components and different configurations, such as hand-marked paper ballot configurations and BMD configurations. Feb. 18, 2020 Tr. at 80:22-81:9 (Boockvar).

45. Information about types of configurations included in each voting system “suite” that the Department is considering for certification is publicly available on the manufacturers’ websites, on the Department’s website, and on the EAC website. Feb. 18, 2020 Tr. at 81:10-19 (Boockvar).

46. The Unisyn OpenElect 1.3.0.2A voting system was certified before the parties entered into the Settlement Agreement. JX 12 at 1.

47. The ExpressVote XL was initially submitted for certification in Pennsylvania as part of the ES&S EVS 6.0.0.0 system. JX 34 at 9; Feb. 18, 2020 Tr. at 79:21-80:8 (Boockvar). After undergoing certain software upgrades, the system, including the ExpressVote XL, was resubmitted for certification as the EVS 6.0.2.1 system. *Id.* No change was made to the ExpressVote XL’s hardware between version 6.0.0.0 and version 6.0.2.1 of the EVS system. Feb. 18, 2020 Tr. at 93:3-13, 94:11-95:1 (Halderman).

48. On July 2, 2018 the EAC certified that the ES&S EVS 6.0.0.0 voting system had been tested against, and conformed to, the Voluntary Voting System Guidelines Version 1.0 (“VVSG 1.0”). Fact. Stip. ¶ 9; JX 8.

49. On November 12, 2018, the EAC certified that the ES&S EVS 6.0.2.1 had been tested against, and conformed to, the VVSG 1.0. Fact. Stip. ¶ 36; JX 28. The certification document was posted publicly the same day. Feb. 18, 2020 Tr. at 105:8-14 (Boockvar).

50. The Department published multiple certification status reports on its website identifying the EVS 6.0.0.0 and EVS 6.0.2.1 as under consideration for certification. JX 12; DX M.

51. On November 30, 2018, the Secretary certified the ES&S EVS 6.0.2.1 voting system suite, including the ExpressVote XL voting system. Fact. Stip. ¶ 43; JX 34.

52. Defendants posted the Certification Report on the Department’s website, where it was accessible to the public, and noted that the EVS 6.0.2.1 system had been certified on subsequent versions of the Certification Status report, which were also posted on the Department’s website and accessible to the public, Fact. Stip. ¶ 44; DX S, DX T, DX U, and publicly reported the certification of the ExpressVote XL in multiple press releases and other public materials. Feb. 18, 2020 Tr. at 153:20-154:4 (Boockvar).

53. Also in 2018, the Department was in the process of examining other voting systems, including the Unisyn OpenElect 2.0A2, the Dominion Democracy Suite 5.5, the ClearVote 1.4.5, and the Verity Voting system. DX M. These examinations were also disclosed in the certification status reports. *Id.*

54. On July 16, 2019, the Department received a Petition to Reexamine the ExpressVote XL. Fact. Stip. ¶ 71; JX 42. On September 3, 2019, the Department issued a Reexamination Report confirming certification of the ExpressVote XL. Fact. Stip. ¶ 75; JX 45.

3. All of the Voting Systems That Have Been Certified for Use in Pennsylvania Under the Department's Initiative Rely on Software and Use Barcodes or Other Symbols Printed on Paper Ballots to Tabulate Votes

55. Every voting system certified for use in Pennsylvania since the Department began its initiative to transition away from DREs, whether it utilizes a hand-marked paper ballot or a ballot-marking device, utilizes barcodes, QR codes, or timing marks to tabulate votes, except for one type of scanner in one of the eight systems. Feb. 18, 2020 Tr. at 113:15-114:1 (Boockvar). No county in Pennsylvania has selected the one type of scanner that does not fit this characterization. Feb. 18, 2020 Tr. at 119:12-18 (Boockvar).

56. Every voting system that has been certified for use in Pennsylvania under the Department's initiative *and* selected for use by at least one county, tabulates votes by scanning human-inscrutable symbols. Feb. 18, 2020 Tr. at 24:21-26:2; 114:2-116:12, 118:24-119:21, 121:15-122:5, 132:17-133:2 (Boockvar); Fact. Stip. ¶¶ 98-105, 106-110; JX 51, JX 52, JX 53, JX 54, JX 55, JX 56, JX 57, JX 58, JX 60, JX 61, JX 62, JX 63.

57. Every voting system that has been certified for use in Pennsylvania under the Department's initiative also records the votes in human-readable text on a piece of paper, which constitutes the official vote of record and would control in the case of a recount or an audit. Feb. 18, 2020 Tr. at 116:13-21, 116:25-118:4 (Boockvar).

58. Software that reads human-inscrutable symbols such as barcodes, QR codes, or timing marks is used to tabulate votes from both hand-marked paper ballots and paper ballots

produced by BMDs, as described below. This software does not consider or even register the human-readable text on the paper.

59. For example, hand-marked ballots typically have human-readable vote selections, with empty ovals next to them. Timing marks around the edge of the ballot act as a grid system, and software on the tabulator uses this grid to register the location of the filled-in ovals that represent the voter's selection. The software does not register the human-readable text. Feb. 18, 2020 Tr. at 113:15-115:5 (Boockvar).

60. By way of further example, on most BMD-produced paper ballots, the voter's selections are printed in human-readable text and in barcodes or other code; the tabulator scans the codes. Feb. 18, 2020 Tr. at 115:6-116:12 (Boockvar).

61. In each case, software on the tabulator is programmed to register votes based on the symbols on the paper ballot, not the human-readable text. Feb. 18, 2020 Tr. at 114:2-115:3 (Boockvar).

62. Pennsylvania requires post-election audits that would identify discrepancies between the human-readable text and the outcome reported by the code-based tabulation. Feb. 18, 2020 Tr. at 116:13-118:4 (Boockvar); JX 34 at 38.

III. Settlement Negotiations

A. Timing of and Parties' Representatives Involved in Settlement Negotiations

63. Settlement negotiations in this case began in September 2018. Feb. 18, 2020 Tr. at 210:3-211:5 (Gates).

64. Secretary of State Kathy Boockvar was the primary Commonwealth representative involved in the settlement negotiations process. Feb. 18, 2020 Tr. at 59:7-10

(Boockvar). Timothy Gates, chief counsel to the Department of State, Kathleen Kotula, Executive Deputy Chief Counsel for the Department of State, John Hartzell, a Deputy to Mr. Gates, and Sue Ann Unger of the Pennsylvania Attorney General's Office, were the lawyers who represented the Secretary in connection with the settlement negotiations process. Feb. 18, 2020 Tr. at 59:11-18 (Boockvar), 164:22-165:16, 211:6-13 (Gates), 254:22-24 (Kotula).

65. Ilann Maazel and Doug Lieb represented the Plaintiffs in the settlement negotiations. JX 20; JX 23; JX 29; Feb. 18, 2020 Tr. at 175:12-17, 178:23-180:1, 211:15-16 (Gates).

66. J. Alex Halderman, who testified as an expert in election security during the 2016 preliminary injunction hearing, served as Plaintiffs' expert designee for purposes of observing Pennsylvania's certification testing, and provided Plaintiffs with guidance over the course of the settlement negotiations. Feb. 19, 2020 Tr. at 3:19-25, 55:5-7 (Halderman); JX 20.

67. In this Court's experience, when a dispute arises over a settlement agreement and testimony about the settlement negotiations is necessary, the lawyer(s) who negotiated the agreement will testify about the negotiations and the substance of the ultimate agreement. In order to give Plaintiffs a full opportunity to present their case, this Court postponed the evidentiary hearing on the Settlement Agreement for a month, largely in order to permit Plaintiffs the opportunity to find replacement counsel so that Mr. Maazel and/or Mr. Lieb could testify. Plaintiffs had other competent counsel who presumably could have stepped in to represent them during this hearing. *See* Jan. 16, 2020 Tr. at 14:10-15:3.

68. Despite this opportunity, both Mr. Maazel and Mr. Lieb declined to withdraw and chose not to testify at the hearing. Accordingly, the only evidence about the settlement negotiations came from Defendants' personnel, the documents, and Dr. Halderman.

B. During the Settlement Negotiations, Both Parties Understood That Any Resolution Would Need to Be Consistent with the Commonwealth's Initiative and That the Secretary Was in the Process of Certifying the ExpressVote XL and Other BMDs

1. The Department Clearly Communicated the Details of its Initiative to Plaintiffs, and Plaintiffs Indicated That They Understood Those Details and Were Satisfied With Them

69. The Commonwealth's "primary goal" in connection with settlement was to "settle the case consistent with the path that [the Commonwealth was] already on" "to require that all counties replace their aging voting systems with new systems that employed a voter-verifiable paper ballot system and also met updated security standards and accessibility testing." Feb. 18, 2020 Tr. at 56:20-57:7 (Boockvar), 210:2-12 (Gates).

70. Defendants communicated this goal to Plaintiffs during the settlement negotiations. Secretary Boockvar "wanted to be very clear [with the Plaintiffs] what the path was that [the Commonwealth was] already on," and directed her lawyers to provide certain information to the Plaintiffs in order to "make it clear what that path entailed." Feb. 18, 2020 Tr. at 59:19-60:5; 61:10-22 (Boockvar).

71. During the settlement discussions, Defendants made clear to Plaintiffs that the Department was working on an initiative to transition Pennsylvania away from paperless DREs and to voting systems with voter-verifiable paper records and that there was an opportunity to resolve the case on terms consistent with this initiative. Feb. 18, 2020 Tr. at 179:19-180:1, 180:22-181:6, 211:22-212:2 (Gates).

72. On September 28, 2018, Sue Ann Unger sent an email to Plaintiffs' counsel with five attachments that were intended "to help explain what [the Commonwealth was] requiring of the counties, what path [the Commonwealth was on], what the timeline was, [so] that they would fully understand what [the Commonwealth was] seeking in the settlement." Fact. Stip. ¶ 16; JX 14; Feb. 18, 2020 Tr. at 60:7-61:9, 97:2-5 (Boockvar).

73. The attachments included Commissioner Marks's February 9, 2018 directive, which stated that "all voting systems purchased **on or after February 9, 2018** must be of the type that employs a voter-verifiable paper ballot or a voter-verifiable paper record of the votes cast by a voter." Fact. Stip. ¶ 18; Feb. 18, 2020 Tr. at 63:23-64:23 (Boockvar); JX 1.

74. The materials also included Commissioner Marks's April 12, 2018 email to the county Boards of Elections attaching a press release indicating the mandate to counties to have voter-verifiable paper record voting systems selected by the end of 2019. Fact. Stip. ¶ 19; Feb. 18, 2020 Tr. at 65:25-66:12 (Boockvar); JX 5.

75. They also included June 12, 2018 Directive Concerning the Conduct of Electronic Voting System Examinations by the Commonwealth of Pennsylvania, stating that "[a]ll voting systems purchased on or after February 9, 2018 in PA must be of the type that employs a voter-verifiable paper ballot or a voter-verifiable paper record of the votes cast by a voter." Fact. Stip. ¶ 20; JX 7.

76. The materials also included Commissioner Marks's September 25, 2018 public testimony to the Senate State Government Committee on the status of the initiative, in which he recounted that national experts and elected officials "have urged states to act as quickly as possible, to replace older voting machines with voting systems that produce a paper record that

voters can verify, and which enable robust post-election audits”; quoted the Securing the Vote Report’s recommendation “that all elections should be conducted with paper ballots by 2020”; and reiterated the Department’s requirement that “[n]ew voting equipment [purchased for use in Pennsylvania] must [] include voter-verifiable paper records.” Feb. 18, 2020 Tr. at 83:1-14 (Boockvar); JX 13 at 1-3.

77. In her September 28 email Ms. Unger also indicated that she would send Plaintiffs’ counsel a form contract for counties’ purchase of voting systems, which “contains some requirements that [the Commonwealth] expect[ed] plaintiffs would support.” JX 14. On the following Monday, October 1, 2018, Ms. Unger sent an email with this contract to Plaintiffs’ counsel. Fact. Stip. ¶ 16; JX 17; Feb. 18, 2020 Tr. at 92:22-94:19, 97:2-5 (Boockvar). The contract required all purchased voting systems to employ a voter-verifiable paper record. JX 18 at 7, 10, 11; Feb. 18, 2020 Tr. at 95:20-96:5 (Boockvar).

78. In an October 5, 2018 telephone conversation between Defendants’ counsel and Plaintiffs’ counsel, Defendants made it clear that DREs were no longer being considered for certification in Pennsylvania, and that Pennsylvania was only considering machines that provided a paper record. Fact. Stip. ¶ 24; JX 19; Feb. 18, 2020 Tr. at 214:14-215:23; Feb. 18, 2020 Tr. at 215:5-16 (Gates). Mr. Maazel indicated that he was “very pleased” with the direction that Pennsylvania was moving in. Feb. 18, 2020 Tr. at 215:19-21 (Gates).

2. The Department Communicated to Plaintiffs, and Plaintiffs Understood, That the Commonwealth Was Considering the ExpressVoteXL and Other BMDs for Certification

79. On September 19, 2018, Ilann Maazel sent an email to Sue Ann Unger requesting “a list of the machines under consideration” for certification in Pennsylvania. Fact. Stip. ¶ 12; JX 11; Feb. 18, 2020 Tr. at 213:3-14 (Gates).

80. The materials attached to Ms. Unger’s September 28, 2018 email, discussed *supra* ¶¶ 72-77, included a September 21, 2018 certification status report. Fact. Stip. ¶ 17; Feb. 18, 2020 Tr. at 77:12-22 (Boockvar). This report identified the ES&S EVS 6000/6021, which includes the ExpressVote XL, as under consideration for certification, and specified that it was scheduled for examination from September 24 to 28, 2018. Feb. 18, 2020 Tr. at 79:8-80:19 (Boockvar), 213:17-214:3 (Gates); JX 12. The report also showed that the OpenElect 1.3.0.2A system had already been certified. JX 12.

81. In the October 5, 2018 telephone conversation between Defendants’ counsel and Plaintiffs’ counsel, the parties discussed the types of voting systems that were being considered for certification in Pennsylvania at that time. Feb. 18, 2020 Tr. at 215:5-16 (Gates). Mr. Maazel indicated that he would provide the list of machines being considered for certification to his expert Dr. Halderman to do a “lemon check,” meaning that he would be checking to confirm that Pennsylvania was not considering any DRE machines for certification. Feb. 18, 2020 Tr. at 215:5-216:24 (Gates).

82. On October 9, 2018 Plaintiffs’ counsel sent Defendants’ counsel an email responding to the September 28, 2018 email, which included comments written by Dr. Halderman. Fact. Stip. ¶ 25; JX 20.

83. Dr. Halderman had received the September 21, 2018 certification status report on or around September 28, 2018. Feb. 19, 2020 Tr. at 87:21-88:7 (Halderman).

84. Dr. Halderman was aware, when he drafted his comments that were included in Mr. Maazel's October 9, 2018 email, that the ExpressVote XL is a component of both the ES&S EVS 6.0.0.0 and EVS 6.0.2.1, and that the ExpressVote XL was part of a voting system that the Department was considering for certification. Feb. 19, 2020 Tr. at 93:3-7, 129:9-25 (Halderman).

85. Dr. Halderman testified that he did not click on the hyperlink in the September 21, 2018 certification status report to learn further information about the systems under consideration. Feb. 19, 2020 Tr. at 88:21-89:3 (Halderman).

86. In his comments in the October 9, 2018 email, Dr. Halderman discussed the voting machines identified in the September 21, 2018 certification status report, which included the ExpressVote XL. JX 20; Feb. 18, 2020 Tr. at 221:6-222:11 (Gates). Dr. Halderman indicated that he “[did not] *disapprove* of any of them in their entirety,” and that “[a]ll of them (that use paper ballots) can be used with reasonable security if implemented with voter-verified paper ballots and robust manual audits.” JX 20. (The only example the email gave of a voting system that did not use a “paper ballot” was a “paperless DRE system.” JX 20; Feb. 19, 2020 Tr. at 112:13-19 (Halderman).) Dr. Halderman further stated that “there are features of each of these voting systems that can render them unsafe if activated,” and suggested that “[p]erhaps [Mr. Maazel] can urge PA to certify them with restrictions that prohibit these dangerous functions.” JX. 20.

87. Dr. Halderman then identified what he saw as the potential “dangerous features” in some of these systems. JX 20. He addressed the “ExpressVote machines” in particular, a term which, especially given the context, was clearly intended to include (and was reasonably understood by Defendants to include) the ExpressVote XL machine. JX 20; JX 21; Feb. 18, 2020 Tr. at 221:6-223:13 (Gates); Feb. 19, 2020 Tr. at 116:3-9, 130:1-6 (Halderman). Dr. Halderman explained that the ExpressVote machines “can work as traditional ballot marking devices, but it’s also possible to configure them in ways that defeat the purpose of the paper trail.” JX 20. Dr. Halderman identified one such “dangerous” configuration as a setup “in which it asks voters whether they want to verify their ballots *before* printing them, and only allows the voter to inspect the paper if they say yes.” JX 20. He provided a link to a blog post at the “Freedom to Tinker” website by Andrew Appel dated September 14, 2018, entitled “Serious design flaw in ESS ExpressVote touchscreen: ‘permission to cheat.’” Fact. Stip. ¶ 26; JX 20; JX 21; Feb. 18, 2020 Tr. at 222:13-18 (Gates).

88. Dr. Halderman concluded that “PA should require the machines to be configured so that every voter has an opportunity to see their completed ballot *after* it’s been printed.” JX 20.

89. In the linked blog post that Dr. Halderman included in his comments, Dr. Appel discusses the issue with the ExpressVote XL configuration that allows voters to opt out of viewing their paper ballot before casting their vote. JX 21; Feb. 18, 2020 Tr. at 222:25-223:13 (Gates); Feb. 19, 2020 Tr. at 120:21-121:2 (Halderman). Dr. Appel’s blog contains a link to a video showing a demonstration of one of the ExpressVote machines Dr. Appel is discussing. Feb. 19, 2020 Tr. at 121:25-123:4 (Halderman). Dr. Halderman never followed the link to the

video. *Id.* at 122:3-14 (Halderman). Dr. Appel also made expressly clear that the issue he was discussing was applicable to the “ExpressVote XL” machine in particular. JX 21, at 2.

90. The ExpressVote XL was certified in Pennsylvania with a requirement that it must be configured to allow physical review of the printed paper ballot before a voter casts her votes, and may not be configured to allow the voter to validate the selections on the screen and “Autocast” her votes without reviewing the physical printed ballot. This was consistent with Dr. Halderman’s proposal as communicated in Mr. Maazel’s October 9, 2018 email. Feb. 18, 2020 Tr. at 223:17-25 (Gates); Feb. 19, 2020 Tr. at 64:6-11, 115:25-116:2 (Halderman); JX 34 at 42 ¶ S, JX 45.

91. In the October 9, 2018, email Mr. Maazel requests “a more granular list” of the voting systems under consideration for certification in Pennsylvania. JX 20. Mr. Gates understood that Mr. Maazel was attempting to clarify whether Pennsylvania was considering any DRE systems for certification. Feb. 18, 2020 Tr. at 219:17-220:6 (Gates).

92. Later on October 9, 2018, Defendants’ counsel and Plaintiffs’ counsel spoke over the phone. Feb. 18, 2020 Tr. at 218:2-17 (Gates); JX 20 (“Here is some feedback before our call this afternoon.”). During the phone call, Mr. Gates assured Mr. Maazel that none of the machines under consideration for certification was a DRE. Feb. 18, 2020 Tr. at 226:17-227:6, 246:9-19, 247:24-248:12 (Gates). The request for a “more granular” list of the machines under consideration for certification was never raised again. Feb. 18, 2020 Tr. at 246:16-19 (Gates).

93. Mr. Gates also explained to Mr. Maazel that Pennsylvania was not considering certifying the ExpressVote XL with the configuration that Dr. Halderman had criticized. Feb. 18, 2020 Tr. at 226:2-15 (Gates).

94. On October 31, 2018, Defendants publicly posted an updated certification status report, which indicated that testing of the ES&S 6021 was complete and that “final certification report and paperwork” was “in progress.” DX M; Feb. 18, 2020 Tr. at 101:10-102:4; 102:20-24 (Boockvar), 238:18-239:2 (Gates).

95. At no point during the settlement negotiations did Plaintiffs protest the potential certification of the ExpressVote XL voting system. Feb. 18, 2020 Tr. at 99:14-17 (Boockvar).

C. Before the Settlement, Plaintiffs Were On Notice of the Features of the ExpressVote XL, Including Nearly All of the Features That They Now Complain About

96. Plaintiffs complain that certification of the ExpressVote XL violates the Settlement Agreement in several ways – that it is not “voter-verifiable” because it tabulates votes by counting barcodes rather than human-readable text; that purported security flaws, such as the path the paper record takes past the printhead on its way to the ballot box, render the vote susceptible to being changed after the voter casts it; and that it does not use a “paper ballot.” Motion to Enforce, ECF 112.

97. Dr. Halderman visited ES&S’s headquarters in Omaha, Nebraska in July 2018, at which time he interacted with the ExpressVote XL and the ExpressVote 2.1, and saw the paper ballot produced by the ExpressVote 2.1, which is identical to the paper ballot produced by the ExpressVote XL. Feb. 19, 2020 Tr. at 103:13-104:23 (Halderman); *infra ¶ 305.*

98. Dr. Halderman knew in September 2018 that the ExpressVote XL was part of the ES&S EVS 6000 and 6021 systems. Feb. 19, 2020 Tr. at 93:3-8 (Halderman).

99. Dr. Halderman was provided with the September 21, 2018 certification status report around the time of its publication, and knew in September 2018 that the Department was

considering the ExpressVote XL for certification. Feb. 19, 2020 Tr. at 87:21-88:7 (Halderman); *supra ¶¶ 83-84.*

100. When Dr. Halderman provided the commentary that Mr. Maazel forwarded to Defendants' counsel on October 9, 2018, he was familiar with the features and method of operation of the ExpressVote XL.

101. For example, Dr. Halderman was aware that the ExpressVote XL uses a summary style paper ballot that indicates only the votes, not the entire menu of candidate options for each race. Feb. 19, 2020 Tr. at 99:6-14 (Halderman).

102. Dr. Halderman did not raise an objection to the ExpressVote XL's summary style paper ballot format in the comments that were included in the October 9, 2018, email, or at any time during the settlement negotiations. JX 20; Feb. 18 Tr. at 100:10-19 (Boockvar); Feb. 19, 2020 Tr. at 139:10-20 (Halderman).

103. As Dr. Halderman admitted, at least three other ballot-marking devices included on the September 21, 2018 certification status report – manufactured by Hart, Dominion, and Unisyn – also record votes on paper records that do not contain the whole menu of options. Feb. 19, 2020 Tr. at 136:7-139:16 (Halderman); JX 54; JX 59; JX 62. Dr. Halderman did not object to this feature of any of these voting systems in the October 9, 2018 email or at any time during the settlement negotiations. Feb. 19, 2020 Tr. at 136: 10-139:18 (Halderman).

104. There is no evidence that Plaintiffs ever protested the Department certifying voting systems that use summary paper records that do not display the entire menu of candidate options at any point during settlement negotiations. Feb. 18, 2020 Tr. at 100:10-19 (Boockvar); Feb. 19, 2020 Tr. at 316:4-16 (Kotula).

105. Although Dr. Halderman equivocated about whether he knew at the time that the XL scans the barcodes to tabulate the vote, the evidence indicates that he did – or, at the very least, must have suspected that was the case. Feb. 19, 2020 Tr. at 52:3-22, 99:18-104:23 (Halderman).

106. Dr. Halderman did not raise an objection to the ExpressVote XL’s use of barcodes in recording and tabulating votes in the October 9, 2018 email or at any time during the settlement negotiations. JX 20.

107. At least two other ballot-marking devices on the September 21, 2018 certification status report – manufactured by Unisyn and Dominion – print human-inscrutable coding (together with the voter-verifiable text) that is scanned to tabulate the vote. Feb. 19, 2020 Tr. at 139:21-141:19 (Halderman); JX 54; JX 62; *see also id.* at 151:19-24 (Halderman’s admission that he was aware at the time of the settlement that at least some of the voting devices in the systems Pennsylvania was considering certifying used “summary card ballots with barcodes to tabulate the vote”). Dr. Halderman did not raise an objection to any of these voting systems on this basis in the October 9, 2018 email or at any time during the settlement negotiations. Feb. 19, 2020 Tr. at 139:21-141:18 (Halderman).

108. There is no evidence that Plaintiffs ever protested the Department certifying voting systems that employ ballot-marking devices at any point during settlement negotiations. Feb. 18, 2020 Tr. at 97:15-19 (Boockvar), 216:25-217:3, 229:13-230:6 (Gates); Feb. 19, 2020 Tr. at 303:24-304:17(Kotula).

109. There is no evidence that Plaintiffs ever protested the Department certifying voting systems that use barcodes to tabulate votes at any point during settlement negotiations. Feb. 19, 2020 Tr. at 304:6-11 (Kotula).

110. Dr. Halderman periodically monitors, and has been published on, a blog entitled “Freedom to Tinker,” which is maintained by the Princeton Center for Information Technology Policy. Feb. 19, 2020 Tr. at 117:16-118:15 (Halderman).

111. Dr. Appel is a mentor and a former teacher of Dr. Halderman. Feb. 19, 2020 Tr. at 124:9-15 (Halderman).

112. Dr. Appel posted an article on the Freedom to Tinker website on October 16, 2018 that asserted that because of the position of the printhead and the scanner in the ExpressVote machines, the machine could add additional votes to the paper ballot after a voter has verified her ballot and cast her votes. DX II; Feb. 19, 2020 Tr. at 155:25-159:11 (Halderman). Dr. Halderman saw this blog post when perusing the Freedom to Tinker website. Feb. 19, 2020 Tr. at 161:16-20 (Halderman).

113. Dr. Appel posted an article on the Freedom to Tinker website on October 22, 2018 that further elaborated on the issue he asserted is posed by the position of the printhead and the scanner in the ExpressVote machines. DX L; Feb. 19, 2020 Tr. at 159:23-161:5 (Halderman). Dr. Halderman saw this blog post when perusing the Freedom to Tinker website. Feb. 19, 2020 Tr. at 161:11-15 (Halderman).

114. Plaintiffs assert that they were not aware of the theoretical issue posed by the position of the printhead and the scanner in the ExpressVote XL during settlement negotiations. Feb. 19, 2020 Tr. at 153:19-154:5, 158:25-159:11 (Halderman). This assertion is not plausible,

given the significant public discussion about this issue during this time period, including by Dr. Halderman's mentor Dr. Appel. *See supra ¶¶ 110-113.*

115. Dr. Halderman did not raise, in the October 9, 2018 email or at any other time during the settlement negotiations, any other objections to certification of the ExpressVote XL other than to the potential configurations under which the voter could opt out of having an opportunity to verify the paper ballot before casting her vote. JX 20; Feb. 18, 2020 Tr. at 100:10-19 (Boockvar), 224:1-6 (Gates).

116. Defendants reasonably understood, based on Plaintiffs' objective manifestations of their own intent, that Plaintiffs did not object to certification of the ExpressVote XL. Feb. 18, 2020 Tr. at 100: 10-19 (Boockvar); 223:9-13, 230:7-16 (Gates).

D. Throughout the Settlement Negotiations, Both Parties Used the Terms “Ballot” and “Paper Ballot” Broadly; There Is No Evidence That Plaintiffs Proposed or Defendants Agreed to a Narrow Use of the Term

117. As discussed *supra* ¶ 27, the Department’s communications about its voting technology upgrade initiative – both to Plaintiffs and to the public – used the terms “ballot” and “paper ballot” loosely and interchangeably with the term “paper record.”

118. Plaintiffs also used the term “ballot” loosely, referring to the voter-verifiable paper records produced by the ExpressVote XL as ballots. *See supra* ¶¶ 86-88; *infra* ¶¶ 119-121.

119. In the email that Mr. Maazel forwarded to Defendants’ counsel on October 9, 2018, Dr. Halderman referred to the paper record produced by the ExpressVote machines as a “ballot” three times, and once to the box in which it is stored as a “ballot box.” JX 20.

120. The October 9, 2018 email also made clear that Plaintiffs considered the paper records produced by the ExpressVote XL to be “paper ballots.” The email clearly communicated that any voting systems that did *not* use “paper ballots” would be categorically unacceptable to Plaintiffs. JX 20; Feb. 19, 2020 Tr. at 111:17-112:12. The email did not contend, however, that ExpressVote XL machines were unacceptable. To the contrary, the email stated that Pennsylvania could “certify them with [certain] restrictions.” JX 20.

121. The linked blog post from Dr. Appel specifically refers to the paper record produced by the ExpressVote XL as a “paper ballot.” JX 21, at 2. Dr. Appel’s post also refers to that paper record as a “ballot” 11 times, and refers once to the box in which it is stored as a “ballot box.” It also quotes an election official, who refers to the paper record produced by this system as a “ballot” four times and refers once to the box in which it is stored as a “ballot

container.” JX 21; Feb. 18, 2020 Tr. at 227:20-228:13 (Gates); Feb. 19, 2020 Tr. at 131:15-133:4 (Halderman).

122. At the hearing, Dr. Halderman studiously referred to the paper record produced by the ExpressVote XL as a “paper record,” and refused to call it a “ballot.”

123. Dr. Halderman attempted to excuse his written description of the paper record as a “ballot” by asserting that he was “speaking imprecisely.” Feb. 19, 2020 Tr. at 53:11-19 (Halderman).

124. Dr. Halderman also testified that his comments that were included in Mr. Maazel’s October 9, 2018 email were “just some quick initial reactions” and “just some quick initial thoughts.” Feb. 18, 2020 Tr. at 32:12-13, 19-20 (Halderman).

125. Dr. Halderman asserted that he “had no idea any of [his comments were] going to be passed on verbatim to the Defendants.” Feb. 19, 2020 Tr. at 128:14-15 (Halderman).

126. Dr. Halderman’s testimony on this point was not plausible or credible. The Plaintiffs asked Dr. Halderman to consult with and advise them on how to best resolve this litigation. Against this background, Dr. Halderman could not reasonably assume that Defendants would not have seen or been apprised of his comments about the list of voting systems under consideration for certification. To the contrary, Dr. Halderman should have known his comments would be passed on and would be an integral part of the parties’ discussions.

127. Plaintiffs presented no plausible or credible evidence that the parties considered or discussed defining “paper ballot” to exclude the summary record produced by the ExpressVote XL and other BMDs. *See, e.g., supra ¶¶ 101-4.*

128. There is no evidence that Plaintiffs ever asserted, at the settlement conference or at any other time, that the definition of “paper ballot” in the Pennsylvania Election Code should be assigned to the term “paper ballot” in the Settlement Agreement. Indeed, there is no evidence that the parties ever discussed the definition of “paper ballot” in the Pennsylvania Election Code. Feb. 18, 2020 Tr. at 99:4-13 (Boockvar), 235:16-236:2 (Gates).

129. There is no evidence that Plaintiffs ever asserted, at the settlement conference or at any other time, that any particular definition should be assigned to the term “paper ballot” in the Settlement Agreement. Feb. 18, 2020 Tr. at 97:20-99:3 (Boockvar).

130. There is no evidence that the parties discussed or considered the National Institute of Standards and Technology (“NIST”) election terms glossary. Indeed, the Commonwealth’s witnesses were not aware of the NIST definitions at the time of the settlement. Feb. 18, 2020 Tr. at 100:20-101:1, 148:21-149:3 (Boockvar), 174:11-16 (Gates).

131. The NIST definitions are not material to this dispute.

132. At the last possible moment, after all of the Commonwealth’s witnesses had testified, Plaintiffs moved the complete Securing the Vote Report into evidence. Feb. 21, 2020 Tr. at 23:24:3.

133. The Securing the Vote Report was one source among many that the Department considered in shaping and furthering its initiative, but there is no evidence that the Department endorsed every single proposal included in the Report. Feb. 18, 2020 Tr. at 86:25-87:22 (Boockvar); DX F.

134. During the settlement discussions, Plaintiffs submitted an ex parte settlement conference summary to Magistrate Judge Timothy Rice. JX 33. Because Defendants never saw

or learned the contents of this document until after Plaintiffs filed their Motion, Fact. Stip. ¶ 31, it is not relevant to Defendants' understanding of the settlement terms and should be disregarded. The summary, however, is consistent with all the other parol evidence of Plaintiffs' understanding of the terms. It states that Plaintiffs' goal in the settlement was to eliminate the use of DREs, including DREs with VVPATs, and that Plaintiffs, like Defendants, used the term "paper ballot" to describe a paper, physical record of the voter's selections, which could be produced by BMDs or hand marking. JX 33 at 2 ("Only a paper ballot – whether marked by the voter's hand, or with a machine called a 'ballot-marking device' – ensures that the result counted by the machine can be verified against a physical record of the voter's true choice."). Similarly, Defendants' ex parte submission, which Plaintiffs saw for the first time at the hearing, is consistent with Defendants' statements to the public and to Plaintiffs about their initiative. PX 1017; PX 1018.

E. Drafting of the Term Sheet and Settlement Agreement

135. The parties attended a settlement conference on October 11, 2018 before Magistrate Judge Rice. Fact. Stip. ¶¶ 11, 29, 30; JX 10; JX 23.

136. Secretary Boockvar, Chief Counsel Tim Gates, Deputy Kotula, and Deputy Hartzel attended the October 11, 2018 settlement conference. Feb. 18, 2020 Tr. at 55:17-19 (Boockvar), 165:11-13 (Gates).

137. Mr. Maazel and Mr. Lieb attended the settlement conference on behalf of the Plaintiffs. Feb. 18, 2020 Tr. at 151:2-16 (Boockvar).

138. At the settlement conference Defendants clearly communicated the Department's position that Defendants would only settle on terms consistent with the Commonwealth's

initiative to transition away from paperless DRE voting systems. Feb. 18, 2020 Tr. at 150:9-151:1 (Boockvar).

139. At the settlement conference the parties “completely agreed...that the path [the Commonwealth was] on, which [] involved ballot-marking devices and hand-marked paper ballots,” and required “a voter-verifiable paper record that was auditable [and] reviewable by the voter before they cast their vote,” was acceptable to both parties. Feb. 18, 2020 Tr. at 100:2-9, 98:5-7, 13-15, 150:20-151:1, 151:10-15 (Boockvar).

140. Plaintiffs drafted the initial term sheet. Feb. 18, 2020 Tr. at 142:2-7 (Boockvar), 230:17-24 (Gates); Fact. Stip. ¶ 32; JX 24.

141. The term sheet that Plaintiffs drafted included the specific terms with respect to which the Court requested evidence. *See ECF 136 ¶ 4a (“paper ballot,” “voter-verifiable record of each vote,” and “capable of supporting a robust pre-certification auditing process”). Compare JX 24 ¶ 2 (initial term sheet drafted by Plaintiffs), with JX 30 ¶ 2 (Settlement Agreement); Feb. 18, 2020 Tr. at 166:25-167:7.*

142. Defendants revised the draft terms by replacing the phrase “[t]he Secretary will require each county in Pennsylvania to implement these new voting systems by the 2020 primaries” with the phrase “[t]he Secretary will continue to direct each county in Pennsylvania to implement these new voting systems by the 2020 primaries,” in order to reflect the fact that the Commonwealth was agreeing to continue pursuing a transition that it had already initiated and pursued. Feb. 18, 2020 Tr. at 58:4-15 (Boockvar), 182:24-183:7 (Gates), JX24, JX25.

143. Defendants required this revision to make clear, consistent with the parties’ earlier discussions, that the Settlement Agreement was not imposing any restrictions on the types of

voting machines that could be certified in Pennsylvania beyond those imposed by the Department's pre-existing initiative. Feb. 18, 2020 Tr. at 57:24-58:19, 97:20-99:3, 234:10-19 (Boockvar).

144. If Plaintiffs had rejected that revision, Defendants would not have agreed to settle. Feb. 18, 2020 Tr. at 105:21-106:19 (Boockvar).

145. This revised language introducing the word "continue" was used in the final signed Settlement Agreement. Feb. 18, 2020 Tr. at 58:16-19 (Boockvar); JX30.

146. Plaintiffs suggested the addition of footnote three on page 2 of the Settlement Agreement, which states: "A VVPAT receipt generated by a DRE machine is not a paper ballot." Feb. 18, 2020 Tr. at 108:20-109:1 (Boockvar); *see* JX 24 n.1 (initial term sheet drafted by Plaintiffs).

147. The content of footnote 2 was the only limitation on the definition of "paper ballot" that Plaintiffs sought to incorporate into the Settlement Agreement, and Defendants agreed to this request. Feb. 18, 2020 Tr. at 109:2-7 (Boockvar).

148. The remainder of the terms proposed in the term sheet were largely unchanged in the final Settlement Agreement. JX 24; JX 25; JX 27.

149. Defendants added a choice of law clause to the settlement terms providing that the contract would be interpreted according to Pennsylvania law. Feb. 18, 2020 Tr. at 167:10-15, (Gates) Settlement Ag. ¶ 23. There is no evidence that the parties intended this choice of law clause to incorporate the definition of "paper ballot" in the Pennsylvania Election Code into the Settlement Agreement. Feb. 18, 2020 Tr. at 236:21-237:14 (Gates).

IV. Interpretation of the Settlement Agreement's Terms

150. The key terms of the Settlement Agreement, for purposes of this dispute, are as follows:

2. The Secretary will only certify new voting systems for use in Pennsylvania if they meet these criteria:

- a. The ballot on which each vote is recorded is paper³;
- b. They produce a voter-verifiable record of each vote; and
- c. They are capable of supporting a robust pre-certification auditing process.

3. The Secretary will continue to direct each county in Pennsylvania to implement these voting systems by the 2020 primaries, so that every Pennsylvania voter in 2020 uses a voter-verifiable paper ballot.

Footnote 3 reads: “A VVPAT receipt generated by a DRE machine is not a paper ballot.”

JX 30 at 2.

151. In their Motion, Plaintiffs contended that the ExpressVote XL does not “produce a voter-verifiable record of each vote,” does not supply a “voter-verifiable paper ballot” or any kind of “ballot,” and is not “capable of supporting a robust pre-certification auditing process” within the meaning of these terms. Plaintiffs’ Mot. to Enforce, Doc. 112, at 7-13.

A. The Unambiguous Terms of the Settlement Agreement

1. “Voter-Verifiable Record of Each Vote”

152. “Voter-verifiable record of each vote,” as used in the Settlement Agreement, means a record that a voter can review and verify before casting her vote. *See, e.g., supra ¶¶ 69-78, 82-95, 105-17, 109-116, 138-145, 148.*

153. The Settlement Agreement does not specify, nor does it require, that the “voter-verifiable record of each vote” be in any particular format. JX 30.

154. It is undisputed that the ExpressVote XL produces a human-readable text record of each voter’s selections. JX 57; Feb. 18, 2020 Tr. at 91:2-17 (Boockvar).

155. The Secretary has required that the machines be configured so that the voter can review and verify this human-readable text record before casting her ballot. JX 34 at 42 ¶ R; Feb. 19, 2020 Tr. at 115:8-116:2 (Halderman).

156. The Settlement Agreement does not require that the “vote” itself be “voter-verifiable,” only that the voting system in question produce a “voter-verifiable *record*” of the vote. JX 30.

157. Therefore, Plaintiffs’ argument that the “vote” made on the ExpressVote XL exists within the barcodes that are scanned to tabulate the vote, rather than within the corresponding human-readable text, is not relevant.

158. In the event that it is necessary to determine the exact physical location of the “vote” on the ExpressVote XL’s paper record, the Court concludes that the official record of the vote is the “vote.”

159. In Pennsylvania, the official record of the vote made on any voting system is the human-readable and human-verifiable text or mark on the paper record, rather than the computer-readable code used to tabulate that text or mark. Feb. 18, 2020 Tr. at 91:14-15 (Boockvar).

160. Therefore, to the extent that a “vote” can be said to have a physical existence, the “vote” on an ExpressVote XL machine is the ExpressVote XL’s human-readable text.

161. The ExpressVote XL produces a “voter-verifiable record of each vote” under the plain meaning of the Settlement Agreement. JX 57.

2. “Ballot” and “Paper Ballot”

162. The commonly understood definition of the term “ballot” is an instrument used for casting a vote. A ballot is defined as “[a]n instrument, such as a paper or ball, used for casting a vote.” *Ballot*, BLACK’S LAW DICTIONARY (11th ed. 2019); *accord, e.g., Ballot*, DICTIONARY.COM, <https://www.dictionary.com/browse/ballot> (“a slip or sheet of paper, cardboard, or the like, on which a voter marks his or her vote”); *Ballot*, THE AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE (4th ed. 2000) (“A sheet of paper or card used to cast or register a vote, especially a secret one.”)

163. Experts in the field of election security use the term “paper ballots” to refer to the type of paper record produced by the ExpressVote XL. The Securing the Vote Report sets forth a specific definition of “paper ballot” that clearly encompasses the paper records produced by the XL machine: “original records that are produced by … a ballot-marking device, which are human-readable … (i.e., voter-verifiable), countable by machine (such as a scanner) or by hand, and which may be recounted or audited by manual examination of the human-readable portion of

the ballot.” DX F at 42-43. Plaintiffs’ own expert Dr. Halderman, in an email communication to the Defendants during settlement negotiations, referred repeatedly to the paper record produced by the ExpressVote XL as a “paper ballot.” JX 20. In this same email, Dr. Halderman provided a link to a blog post written by his mentor Dr. Appel, a Professor of Computer Science at Princeton University, in which Dr. Appel repeatedly referred to the paper record produced by the ExpressVote XL as a “paper ballot.” JX 21.

164. Under the commonly understood definition of the term “ballot,” a ballot need not take any particular form and need not present the entire range of options that were originally available to the voter. *See supra ¶¶ 25, 28, 163-64.*

165. Nothing in the plain language of the Settlement Agreement indicates that the term “ballot” should be read more narrowly to mean only instruments that present the entire range of options available to the voter. JX 30.

166. The phrase “ballot on which each vote is recorded is paper” means that the medium used for casting a vote must be paper. JX 30; *see, e.g., supra ¶¶ 69-95, 100-4, 127-31, 134, 138-149.*

167. Nothing in the plain language of the Settlement Agreement indicates that this paper instrument must present the entire range of options available to the voter. JX 30.

168. The only limitation of the term “ballot” or “ballot on which each vote is recorded is paper” in the Settlement Agreement appears in footnote 3 to the Settlement Agreement, which provides that “A VVPAT receipt generated by a DRE machine is not a paper ballot.” JX 30; *supra ¶¶ 146-47.*

169. This footnote buttresses the conclusion that the terms “ballot” and “ballot on which each vote is recorded is paper,” as used in the Settlement Agreement, do not require a piece of paper that lists the entire range of options available to the voter. A VVPAT receipt generated by a DRE machine sets forth only the voter’s selections. Feb. 19, 2020 Tr. at 188:5-14 (Baumert). Accordingly, if the terms “ballot” and “ballot on which each vote is recorded is paper” excluded selection-only records, footnote 3 would be superfluous.

170. The plain language and structure of the Settlement Agreement show that the term “voter-verifiable paper ballot,” as used in Paragraph 3 of the Settlement Agreement, means the voting medium described in Paragraph 2 of the Settlement Agreement. JX 30.

171. The ExpressVote XL produces a document that is a “ballot,” a “ballot on which each vote is recorded [that] is paper,” and a “voter-verifiable paper ballot” under the plain meaning of the Settlement Agreement. *See supra ¶¶ 83-116.*

172. Plaintiffs sought elimination of DRE machines in Pennsylvania from the very outset of this lawsuit, and that was their purpose in negotiating a settlement. *See supra ¶¶ 2-8, 69-78, 91-92, 134-148.* Though Plaintiffs now attempt to expand the meaning of the terms of the Settlement Agreement, there is no evidentiary basis to support their position.

3. “Capable of supporting a robust pre-certification auditing process”

173. Plaintiffs contend that the ExpressVote XL is not “capable of supporting a robust pre-certification auditing process” because the device is, in theory, susceptible to hacking that could cause the device’s paper ballots to be inaccurate. Pl. Mot. at 2, 7-8; Feb. 19, 2020 Tr. at 13:20-14:10 (Halderman).

174. The Settlement Agreement, like Pennsylvania law, does not require that voting machines be “held to an impossible standard of invulnerability.” *Banfield v. Cortes*, 110 A.3d 155, 174 (2015). The theoretical and highly speculative possibility that a hack could undermine an audit does not make the ExpressVote XL incapable of “supporting a robust pre-certification auditing process.”

175. Because the ExpressVote XL produces a voter-verifiable paper record of the vote, it is “capable of supporting a robust pre-certification auditing process” under the plain meaning of the Settlement Agreement. *See supra ¶¶ 57, 62, 90, 174, infra ¶¶ 176, 314-15, 331, 336.*

176. The ExpressVote XL did support a robust pre-certification audit conducted by Philadelphia following the November 2019 general election. Feb. 18, 2020 Tr. at 116:13-118:4 (Boockvar); Feb. 19, 2020 Tr. at 69:18-22 (Halderman).

B. The Parol Evidence of the Parties’ Intent

177. To the extent that the relevant terms of the Settlement Agreement are ambiguous, the parol evidence presented at the hearing demonstrated that both parties understood the Settlement Agreement to allow the Secretary to certify BMDs such as the ExpressVote XL.

178. For nearly a year before the settlement, the Department had been engaged in a well-documented, well-publicized initiative to upgrade Pennsylvania voting technology to require paper-based voting systems. *See supra ¶¶ 12-24, 37-54.*

179. Before entering into the Settlement Agreement, Plaintiffs were aware of this effort and were aware that the Department was considering all-in-one BMDs, including the ExpressVote XL, for certification. *See supra ¶¶ 69-95, 97-99, 103, 107.*

180. Before entering into the Settlement Agreement, Plaintiffs were aware that the Department intended to move forward with its initiative and that settlement was contingent on its ability to do so. *See supra ¶¶ 70-71, 138-39.* Indeed, at the Department’s suggestion, the parties incorporated a term in the provision that required the Department to “continue” its efforts. *See supra ¶¶ 140-145.*

181. The parties understood that paragraphs 2 and 3 of the Settlement Agreement required the Department to continue with its existing plans to certify only paper-based voting systems, which would include hand-marked paper ballots with scanners, BMD-marked paper ballots with scanners, and all-in-one BMDs. *See supra ¶¶ 138-39, 142-43.*

182. Before entering into the Settlement Agreement, Plaintiffs were aware that the ExpressVote XL used barcodes to tabulate votes; that the ExpressVote XL used a summary style paper ballot, rather than a ballot indicating the entire menu of candidate options; and that the ExpressVote XL’s paper ballot passes under a printhead after the voter has the opportunity to verify it. *See supra ¶¶ 83-84, 87, 89, 97-101, 105, 110-14.*

183. Before executing the Settlement Agreement, and for many months thereafter, Plaintiffs never raised any objections to these features of the ExpressVote XL. *See supra ¶¶ 102, 104, 106, 108-9, 115-16.*

184. In the negotiations that led up to the Settlement Agreement, Plaintiffs never indicated that they were opposed to certification of voting machines that used bar codes or other machine-readable technology to tabulate votes, that printed summary ballots, or that had the ExpressVote XL’s paper path configuration. *See supra ¶¶ 102-4, 106-9, 114-15.*

185. During the settlement negotiations, Plaintiffs’ counsel forwarded an email from Dr. Halderman to Defendants’ counsel stating that the ExpressVote machine could be certified. *See supra ¶¶ 82, 86-88.*

186. Throughout the settlement negotiations, both parties used the terms “ballot” and “paper ballot” broadly, in a way that encompassed the paper records produced by the ExpressVote XL. *See supra ¶¶ 27, 72-76, 117-134.*

187. During the settlement negotiations, Plaintiffs understood that Defendants used the terms “voter-verifiable paper record” and “voter-verifiable paper ballot” interchangeably. *See supra ¶¶ 27, 72-76, 117, 127-29.*

188. During the settlement negotiations, Plaintiffs never requested and the parties never discussed narrowing the definition of “ballot” or “paper ballot” to include only particular types of paper records. *See supra ¶¶ 127, 129.*

189. During the settlement negotiations, the parties never discussed the definitions of “paper ballot” in the Pennsylvania Election Code, the NIST definitions, or any other source. The parties had no understanding that the Settlement Agreement incorporated definitions from those sources. *See supra ¶¶ 128, 130.*

190. All of this evidence demonstrates that at the time of the Settlement Agreement, both parties understood that the ExpressVote XL complied with the terms of the Settlement Agreement.

V. Post-Settlement Events and Correspondence Between the Parties

A. After the Settlement, Plaintiffs and Their Counsel Committed to Closely Monitoring Compliance With the Settlement Agreement

191. On the day after the Settlement Agreement was signed, Plaintiffs' counsel posted a notice on its website, which quoted Mr. Maazel as saying, "We will be watching closely to ensure Pennsylvania implements every one of [the agreement's] important election reforms." Fact. Stip. ¶ 42; JX 33; Feb. 18, 2020 Tr. at 110:25-111:13 (Boockvar).

192. On the day of the settlement, Plaintiff Jill Stein posted a press release on Twitter, stating, "Huge victory for election integrity! We just settled our #recount lawsuit in Pennsylvania for a guarantee that PA will use paper ballots by 2020" DX N at 1; Feb. 19, 2020 Tr. at 141:20-142:10 (Halderman).

193. Another Twitter user, Jennifer Cohn, responded with a criticism of the settlement: "I hate to be Debbie Downer, but this agreement allows PA to buy awful 'universal use' touchscreen ballot markers and scanners, which generate the COMPUTER marked so-called 'paper ballots' w/barcodes that I've been warning about..." DX N at 3; Feb. 19, 2020 Tr. at 143:16-22 (Court comment on evidentiary value)

194. Dave Schwab, the then-communications director for Jill Stein's recount efforts, responded to Ms. Cohn's tweet, stating:

Yes, the technology matters. This is exactly why, under the terms of the settlement, the Stein campaign will be appointing election security expert J. Alex Halderman to observe and provide input to Pennsylvania as they proceed to evaluate and certify new voting machines ...

Halderman, the recount team and fellow election integrity advocates will be doing [advocacy with the Commonwealth] with a commitment to paper ballots and robust, automatic audits ...

DX N at 3; Fact. Stip. ¶ 41; Feb. 19, 2020 Tr. at 143:16-22 (Court comment on evidentiary value).

195. Mr. Schwab responded to Ms. Cohn's comment about barcodes as follows:

Barcodes specifically have been a lightning rod for criticism, but the actual risks are small so long as post-election audits manually verify the human-readable text on the ballot....

These last two points are why having Alex Halderman at the table representing the election integrity community during PA's machine certification and audit development will be especially valuable.

DX N at 4; Feb. 19, 2020 Tr. at 143:16-22 (Court comment on evidentiary value); *id.* at 146:22-148:24 (Halderman).

196. Ms. Cohn responded to Mr. Schwab's comments with a series of comments about the purported flaws of BMDs that use barcodes and about the ExpressVote in particular. DX N at 4-13; Feb. 19, 2020 Tr. at 149:5-153:11 (Halderman).

197. Both Ms. Cohn and Mr. Schwab included, in certain of their tweeted comments, references to Dr. Halderman's Twitter username ("@jhalderm"), which meant that Dr. Halderman received notifications of those tweets. DX N; Feb. 19, 2020 Tr. at 148:21-149:4.

198. If Plaintiffs had been unaware of any of Ms. Cohn's comments, they could easily have called a witness to testify to that fact. But Plaintiffs did not do so.

199. The Court concludes that Plaintiffs, through Mr. Schwab and Dr. Halderman, were aware of Ms. Cohn's comments when they were made, or shortly thereafter.

B. Plaintiffs' Knowledge of the Department's Certification of the ExpressVote XL

200. Before they entered into the settlement, Plaintiffs were aware that the ExpressVote XL had been certified by the EAC and was being examined for certification in Pennsylvania, and they were aware of the features of the ExpressVote XL. *See supra ¶¶ 79-84, 87-89, 93-94, 97-102, 105, 110-114.*

201. It would have been reasonable for the Department to assume that Plaintiffs would keep themselves abreast of publicly available information on the status of the Department's certification efforts, given Plaintiffs' interest in the matter, Plaintiffs' explicit commitment to do so, and the wealth of easily accessible public information on this topic. *See supra ¶¶ 110, 191; infra ¶¶ 202-5, 207-9.*

202. On November 30, 2018, the Department issued a report certifying the EVS 6.0.2.1 system, including the ExpressVote XL, for use in Pennsylvania. Fact. Stip. ¶ 43; JX 34.

203. Although Defendants did not directly communicate the certification of the ExpressVote XL to Plaintiffs, the Department posted the Certification Report on its website, where it was accessible to the public. Fact. Stip. ¶ 44; Feb. 18, 2020 Tr. at 240:9-13 (Gates).

204. The Department also publicly reported the certification of the ExpressVote XL in multiple press releases and other public materials. Feb. 18, 2020 Tr. at 153:20-154:4 (Boockvar).

205. Over the months that followed, the Department also published multiple certification status reports on its website, each of which indicated that the EVS 6.0.2.1 had been certified. DX S, DX T, DX U; Feb. 18, 2020 Tr. at 266:5-268:5 (Kotula).

206. At the hearing, Plaintiffs presented no evidence as to when they first learned of the Commonwealth's certification of the EVS 6.0.2.1 and the ExpressVote XL.

207. Dr. Halderman is a computer expert dealing with election computer systems. Feb. 19, 2020 Tr. at 91:19-21 (Halderman). Given Dr. Halderman's expertise, his involvement in this litigation, and the fact that he had received the September 21, 2018 certification status reports showing the status of voting systems testing, the Court concludes that Dr. Halderman should have, and likely did, learn of the Commonwealth's certification of the EVS 6.0.2.1 shortly after it took place.

208. Plaintiffs' assertion that they did not know of the Commonwealth's certification of the ExpressVote XL when it occurred or soon thereafter was implausible. As Secretary Boockvar put it, "You [would] pretty much have to be living under a rock to not have seen that [the ExpressVote XL] was certified." Feb. 18, 2020 Tr. at 154:4-5 (Boockvar).

209. Because evidence as to when Plaintiffs learned of the certification was uniquely within Plaintiffs' control, yet they did not produce that evidence, the Court concludes that the evidence would not have been favorable to Plaintiffs. Accordingly, the Court concludes that Plaintiffs learned of the certification when it occurred or shortly thereafter.

C. Dr. Halderman's Requests for Videos of Voting System Testing

210. The Settlement Agreement required the Secretary to ensure "that Plaintiffs are made aware of all currently scheduled, and future scheduled, Commonwealth on-site certification testing for Voting Systems," and allowed Plaintiffs to send a representative to attend public portions of that on-site testing. JX 30 ¶ 4.

211. There is no evidence that the Secretary did not comply with this provision.

212. At the time of the Settlement Agreement, the on-site testing for the ExpressVote XL, along with the other components of EVS 6.0.2.1, had already been completed. Feb. 18, 2020 Tr. at 275:3-276:7 (Kotula); February 19, 2020 Tr. at 309:24-310:3 (Kotula).

213. The Settlement Agreement did not require the Department to provide Plaintiffs with any videos of voting system examinations, whether these examinations took place before or after the settlement. JX 30; Feb. 18, 2020 Tr. at 277:15-278:23 (Kotula).

214. Nonetheless, as a courtesy, the Department agreed to provide videos of examinations to Dr. Halderman. Feb. 18, 2020 Tr. at 259:21-260:9 (Kotula).

215. Providing the videos was a lengthy and burdensome process. There were dozens of hours of video, because each examination lasted for several days. Feb. 18, 2020 Tr. at 261:1-19, 279:4-17 (Kotula). Before providing any video to Dr. Halderman, the Department needed to have the manufacturer review the video for confidential material. Feb. 18, 2020 Tr. at 266:14-267:19, 279:18-280:18 (Kotula). If the manufacturer requested redactions, Department personnel had to perform the redactions before providing the video to Plaintiffs' counsel. Feb. 18, 2020 Tr. at 280:6-10 (Kotula).

216. In an email dated January 29, 2019, Dr. Halderman requested videos of "other vendors' systems." He did not specifically request videos from the examination of ES&S systems or ask the Department to prioritize production of those videos. JX 36; Fact. Stip. ¶ 49; Feb. 18, 2020 Tr. at 280:19-281:3 (Kotula).

217. The Department worked diligently to respond to Dr. Halderman's request. It sent Dr. Halderman videos of the functional examination of Dominion voting systems on May 16, 2019. Fact. Stip. ¶ 62.

218. The Department sent Dr. Halderman videos of the functional examination of the ES&S systems on June 5, 2019. Fact. Stip. ¶ 69. According to Dr. Halderman, the Department provided “30 to 40 video clips, some of them lasting an hour or more.” Feb. 19, 2020 Tr. 39:5-12 (Halderman).

219. Dr. Halderman began reviewing the video clips in early July 2019, about a month after receiving them. Feb. 19, 2020 Tr. at 49:1-3 (Halderman).

220. In his testimony, Dr. Halderman did not describe or identify any particular section of the videos.

221. Neither Plaintiffs’ Motion, nor the communications that Plaintiffs sent to the Department before filing their Motion, made any reference to any particular section of the videos. Feb. 19, 2020 Tr. at 297:10-298:3, 317:9-319:4 (Kotula).

222. Plaintiffs provided no evidence that anything in the video clips of the ExpressVote XL functional examination provided them with any new information about the ExpressVote XL, let alone information that Plaintiffs needed to pursue their challenge to the ExpressVote XL’s certification.

223. At the hearing, Plaintiffs sought to have the entire set of ES&S examination videos that the Department had provided to Dr. Halderman – some 17 hours – admitted into evidence. The Court recessed in order to give Plaintiffs an opportunity to identify which, if any, clips of the videos had any bearing on the dispute. Plaintiffs declined to do so. Feb. 19, 2020 Tr. at 41:13-43:24 (Halderman).

224. The Court concludes, from Plaintiffs’ refusal to identify specific portions of the videos, that nothing in the videos was helpful to Plaintiffs’ position.

225. The Court concludes that the video of the ExpressVote XL examination has no bearing on this dispute, and that the timing of the Department’s production of the video to Dr. Halderman does not explain or excuse Plaintiffs’ delay in filing their Motion.

D. Plaintiffs’ Communications With the Department About the ExpressVote XL’s Purported Violations of the Settlement Agreement

226. On July 16, 2019, a group of Pennsylvania voters filed a petition for reexamination of the ExpressVote XL. JX 42; Fact. Stip. ¶ 71. This petition contended, *inter alia*, that the ExpressVote XL violates the Settlement Agreement because it does not produce a “paper ballot.” JX 42 at 12. The petition also contended that the ExpressVote XL was insecure because of the printhead issue discussed above. *Id.* at 1-2.

227. Shortly thereafter, in a letter dated July 29, 2019, Plaintiffs first notified the Department that they contended that the ExpressVote XL violated the Settlement Agreement. Fact. Stip. ¶ 72; JX 43; Feb. 18, 2020 Tr. at 111:19 – 112:2 (Boockvar).

228. Plaintiffs’ July 29 letter raised only one issue: that the ExpressVote XL did not produce a “voter-verifiable record of each vote” because it used a barcode to tabulate the vote.

229. At the time they sent the July 29 letter, Plaintiffs were aware of the petition for reexamination. Feb. 19, 2020 Tr. at 165:6-166:1 (Halderman). Nonetheless, the July 29 letter did not contend, as the petition for reexamination did, that the ExpressVote XL does not provide a “paper ballot” or that the paper path was insecure. JX 43; Feb. 18, 2020 Tr. at 241:6-10 (Gates); Feb. 19, 2020 Tr. at 52:15-18 (Halderman).

230. After further correspondence between Plaintiffs and the Department, Plaintiffs sent another letter on October 1, 2019. In this letter, Plaintiffs reasserted their argument about the barcode and raised, for the first time, two other concerns: that the ExpressVote XL does not

produce a “paper ballot,” and that it could allow the printhead to alter the ballot after the voter has reviewed it. Fact. Stip. ¶ 78; JX 48; Feb. 18, 2020 Tr. at 242:18 – 243:9 (Gates).

231. Plaintiffs filed their Motion to Enforce the Settlement Agreement on November 26, 2019. Plaintiffs have offered no reasonable excuse for their significant delay in filing their Motion to Enforce.

232. Although the Commonwealth had certified several other voting systems with the same vote-tabulating functionality as the XL (namely, tabulation of votes via barcode or other symbols), Plaintiffs did not challenge any other system. *See supra* ¶¶ 55-56, 58-61.

VI. The City of Philadelphia’s Efforts to Comply with the Commonwealth’s Directive to Transition to Voting Systems with a Paper Record by the 2019 General Election

233. The City of Philadelphia began the process of transitioning to a new voting system in April of 2018, meeting with the Secretary to discuss the many issues involved and beginning to research different types of voting systems and factors the City should consider in response to the Commonwealth’s mandate. Feb. 18, 2020 Tr. at 126:20-127:6 (Boockvar).

234. In procuring this new voting system, the City utilized a Best Value procurement process. Best Value is a noncompetitive bid process used by the City for complex, large purchases. Best Value allows the City to review proposals based on technical requirements or qualitative components, with pricing scored separately. Feb. 21, 2020 Tr. at 4:7-10, 5:2-5 (Nesmith-Joyner).

235. The first phase of a Best Value procurement involves “figuring out what the market has to offer.” This involves soliciting information about what types of products are available, analyzing the information received, and then utilizing that information to draft a request that will meet the City’s needs. Feb. 21, 2020 Tr. at 4:18-19, 5:21-6:8 (Nesmith-Joyner).

236. Using these early conversations with the Commonwealth, the City began to draft a Request for Information (“RFI”) to allow interested voting system vendors the opportunity to provide potentially relevant information to the City. Feb. 18, 2020 Tr. at 127:3-8 (Boockvar); Feb. 19, 2020 Tr. at 326:10-16 (Nesmith-Joyner).

237. This RFI was publicly posted by the City of Philadelphia on June 4, 2018. Feb. 21, 2020 Tr. at 18:1-3 (Nesmith-Joyner).

238. Over the next several months, the information received in response to this RFI was reviewed and used by the City of Philadelphia to craft a Request for Proposal (“RFP”) for a new voting system. Feb. 19, 2020 Tr. at 326:25-327:2 (Nesmith-Joyner).

239. The RFP was drafted through collaboration between multiple City departments, including the Office of Innovation Technology, the City Commissioners, the Office of Economic Opportunity, and the Procurement Department. For complex purchases, the drafting process can take up to two months. Feb. 19, 2020 Tr. at 327:11-13 (Nesmith-Joyner); Feb. 21, 2020 Tr. at 7:19-22, 8:16-24 (Nesmith-Joyner).

240. Once this RFP was drafted, a review process took place that involved consultation with various City of Philadelphia stakeholders and multiple levels of approval. Feb. 19, 2020 Tr. at 327:17-22 (Nesmith-Joyner); *see also* Feb. 21, 2020 Tr. at 7:22-25 (Nesmith-Joyner).

241. On November 30, 2018, the City of Philadelphia publicly posted the RFP for a new voting system, with proposals due by December 28, 2018. Fact. Stip. ¶ 45.

242. The proposals submitted in response to the RFP were reviewed by a selection committee tasked with evaluation based on best value guidelines. Feb. 19, 2020 Tr. at 328:1-5 (Nesmith-Joyner).

243. The Selection Committee consists of an odd number of members, with representatives spanning across a variety of offices that have an interest in the procurement. Once the proposals are disseminated to the group, each member independently scores each proposal's technical specifications. The entire group then convenes to discuss the proposals and their scores. Feb. 21, 2020 Tr. at 8:16-25, 9:1-4 (Nesmith-Joyner).

244. After the technical scores have been finalized, the Selection Committee begins a similar process of scoring the cost proposals. Both the technical and price scoring are then provided to the Procurement Department for final tallying and determination of the vendor with the highest score. Feb. 21, 2020 Tr. at 9:23-10:18 (Nesmith-Joyner).

245. Based on the results from the Selection Committee, on February 20, 2019 Philadelphia's City Commissioners voted to purchase the ExpressVote XL. Fact. Stip. ¶ 50.

246. On February 20, 2019, the Philadelphia City Commissioners Office issued a press release regarding Philadelphia's decision to purchase the ExpressVote XL. JX 37.

247. Following the selection of the ExpressVote XL, the City of Philadelphia began the process of negotiating and drafting a contract with ES&S. Feb. 19, 2020 Tr. at 329:24-25 (Nesmith-Joyner); Feb. 21, 2020 Tr. at 13:4-7 (Nesmith-Joyner).

248. The City finalized and signed a contract with ES&S for the purchase of 3,750 ExpressVote XL voting machines almost three months later, on May 13, 2019. Fact. Stip. ¶ 60; PX 1004; Feb. 19, 2020 Tr. at 338:16-19 (Nesmith-Joyner); Feb. 21, 2020 Tr. at 34:17-19 (Lynch).

249. Delivery of the 3750 Express Vote XL machines to the City of Philadelphia took approximately four months, with the first shipment arriving in April 2019 and continuing through August 2019. Feb. 21, 2020 Tr. at 34:9-12, 35:1-2 (Lynch).

250. To appropriately store the machines, the City had to procure a special warehouse that needed to be climate controlled, have electrical lines run, and the floor sealed. Feb. 21, 2020 Tr. at 34:13-15, 35:18-23 (Lynch).

251. For each ExpressVote XL voting machine that was delivered, the Philadelphia County Board of Elections (“Board”) was responsible for performing functionality testing or “user acceptance testing” on every machine. This testing took approximately 45 minutes for each of the 3750 machines. Feb. 21, 2020 Tr. at 44:22-45:10 (Lynch).

252. Representatives from ES&S traveled to Philadelphia to train Board staff, including 18 technicians on the operation of the ExpressVote XL. Feb. 21, 2020 Tr. at 40:19-41:1 (Lynch).

253. Those Board staff in turn trained over 8,000 poll workers and interpreters on the use of the new machines. These trainings took place in a set of classes in the Summer of 2019. The set of classes lasted approximately six to eight weeks and consisted of over 100 training sessions. This same process was repeated in the fall of 2019 prior to the General Election. Feb. 21, 2020 Tr. at 40:4-5, 41:5-20 (Lynch).

254. These thousands of poll workers and interpreters are responsible for running the day-to-day operations on election day, and many are elderly. Feb. 21, 2020 Tr. at 42:2-10 (Lynch).

255. Throughout the City of Philadelphia, the Board held over 830 public demonstrations and trainings on the use of the ExpressVote XL prior to the 2019 General Election. Additional public demonstrations and trainings are still ongoing today. Feb. 21, 2020 Tr. at 42:12-15 (Lynch).

256. Prior to the 2019 General Election, the Board inspected all of the over 800 polling locations in the City of Philadelphia to confirm they could accommodate the ExpressVote XL. In some instances polling places needed to be relocated and the general public notified of the change in location. Feb. 21, 2020 Tr. at 42:21-43:3 (Lynch).

257. To accomplish the transition to a new voting system with a paper record prior to the 2019 General Election, the Board frequently worked seven days a week, sometimes 12 hours a day, over course of the transition period. The Board workers “were really pushing it” to meet the deadline. Feb. 21, 2020 Tr. at 35:12-14 (Lynch).

258. The 2019 General Election took place on November 5, 2019. Fact. Stip. ¶ 85.

259. Voters in Philadelphia who voted at over 800 polling locations in the 2019 General Election used the ExpressVote XL to vote. Fact. Stip. ¶ 88; Feb. 21, 2020 Tr. at 33:11-13 (Lynch).

260. In addition to the labor expended in transitioning to the ExpressVote XL, the City of Philadelphia also incurred significant financial costs. The price of the May 13, 2019 contract that the City executed with ES&S for the purchase of the 3750 ExpressVote XL voting machines was approximately \$29 million. Fact. Stip. ¶ 60; PX 1004; Feb. 19, 2020 Tr. at 338:16-19 (Nesmith-Joyner); Feb. 21, 2020 Tr. at 34:17-19 (Lynch).

261. The City of Philadelphia also incurred additional expenses incidental to procuring the ExpressVote XL, including \$1.6 million in related supplies, \$1.2 million for a transition consultant, and over \$1 million in lease costs and tenant improvements for a new warehouse to store the machines. Feb. 21, 2020 Tr. at 57:7-16 (Nesmith-Joyner)

262. In 2019 “Philadelphia really expedited, in every way it possibly could,” the process of replacing its voting machines in order to comply with the Commonwealth’s directive, “and it still took them 18 months to do it.” Feb. 18, 2020 Tr. at 124:20-24, 126:20-128:5 (Boockvar). This effort involved “a huge, huge, huge amount of work.” Feb. 18, 2020 Tr. at 128:4-5 (Boockvar).

263. The Department began its initiative in 2018 “very intentionally so that counties could have the option of getting [it] done in 2019,” which was a non-presidential election year and a year during which no major election law changes were being introduced. Feb. 18, 2020 Tr. at 124:17-25 (Boockvar).

264. Because 2020 is a presidential election year, and because several new election laws are currently being implemented in Pennsylvania under the recently enacted Act 77, the counties are facing many additional pressures this year in preparing for the November 2020 elections as compared with preparations for the November 2019 elections. Feb. 18, 2020 Tr. at 125:3-126:11 (Boockvar).

265. There was no evidence presented that what occurred following decertification of the Winvote system and its replacement by three small Pennsylvania counties in 2007-2008 bears any relevance to a potential decertification of the ExpressVote XL. *See* Feb. 18, 2020 Tr. at 38:8-40:21 (Boockvar).

266. Montgomery County began its efforts to transition to a new voting system in February 2018 and was not able to use its new system until May 2019. Feb. 18, 2020 Tr. at 129:1-20 (Boockvar); *see also id.* at 43:19-44:20 (Boockvar) (discussing Northampton County's timeline for transitioning to a new voting system). Moreover, whether assessed by number of voters, number of polling places, or number of poll workers, there is no comparison between Philadelphia and Montgomery counties; Montgomery County is a much smaller jurisdiction. *Id.* at 129:21-130:9 (Boockvar). There was no evidence presented that the timeline on which Montgomery County obtained new voting systems in 2019 bears any relevance to a potential decertification of the ExpressVote XL and the impact thereof on Philadelphia or any other county. Feb. 18, 2020 Tr. at 129:1-130:9 (Boockvar).

267. Several other counties in addition to Philadelphia also made significant efforts to comply with the Department's mandate that counties replace their voting systems by 2020, and ultimately moved forward with purchases of ExpressVote XL systems in 2019. Fact. Stip. ¶¶ 54, 63, 66, 70, 88.

268. In order to meet the Department of State's December 31, 2019 deadline for replacement of DRE machines, these counties expended significant funds and time on reviewing and procuring ExpressVote XL machines during 2019. ECF 123, at 32; Feb. 18, 2020 Tr. at 43:19-44:20 (Boockvar).

VII. Chaos Will Ensue if the City of Philadelphia Is Required to Replace Voting Systems Prior to the November 2020 Election, Or Within The Next Two Years

A. Replacement of the City's Voting Systems Will Take Substantial Time if Done Responsibly

269. If the ExpressVote XL voting machines were to be decertified, the City of Philadelphia would have to go through another lengthy procurement process to obtain a new voting system. Feb. 19, 2020 Tr. at 334:8-19 (Nesmith-Joyner).

270. Every precinct is required to have at least one ballot marking device in order to be HAVA compliant. *See supra ¶ 39.* If the City of Philadelphia were to transition to hand marked paper ballots, it would still be necessary to procure ballot marking devices if the ExpressVote XL were to be decertified. Feb. 18, 2020 Tr. at 122:11-15 (Boockvar).

271. The City of Philadelphia has not used an exclusively hand marked paper ballot system to vote for over half a century. Feb. 21, 2020 Tr. at 46:19-23 (Lynch).

272. Monique Nesmith-Joyner, the City of Philadelphia's Procurement Commissioner, anticipates that the entire procurement process to obtain a new voting system would take a minimum of 18 to 24 months. Feb. 19, 2020 Tr. at 347:4-17 (Nesmith-Joyner).

273. Because of the complexity of purchasing voting systems, and the high impact of the purchase on the City, the Procurement Commissioner would recommend that the City again utilize a Best Value procurement method for a new voting system. The Commissioner explained that the “lowest price … doesn’t always yield us the best option.” Feb. 21, 2020 Tr. at 5:7-18 (Nesmith-Joyner).

274. The Procurement Commissioner’s 18 to 24 month estimate accounts for a number of factors that are outside of the control of the Procurement Department. These factors include

obtaining approval from City Council for an extended contract, obtaining approval from LCORC for any RFP that is over \$2 million, responsibilities of the City Commissioners in selecting a new voting system, and approval from the Director of Finance, the Mayor's Office, and City Council for the funds needed for a purchase of this magnitude. Feb. 19, 2020 Tr. at 347:22-25, 348:1-10; Feb. 21, 2020 Tr. at 14:5-15:4 (Nesmith-Joyner).

275. If the City were to go through another Best Value procurement for a new voting system, the Procurement Commissioner would recommend issuing a new RFI and RFP. This is because new voting systems have been certified by the Commonwealth of Pennsylvania since 2018. A new RFI would be needed to obtain information on those new systems to draft a more inclusive RFP. Feb. 21, 2020 Tr. at 15:14-25 (Nesmith-Joyner).

276. The Procurement Commissioner explained that utilizing the same RFI or RFP would "narrow" the scope of the procurement and "maybe not yield the best option for the City." Feb. 21, 2020 Tr. at 15:23-16:3 (Nesmith-Joyner).

277. Additionally, the City has no knowledge of whether the voting systems outlined in the 2018 RFI and RFP still exist, or exist in the same format, as they did in 2018. Feb. 21, 2020 Tr. at 16:10-16 (Nesmith-Joyner).

278. Even if the City of Philadelphia were to bypass the RFI and RFP process, the Procurement Commissioner does not believe there is enough time to go through the selection process and negotiate and execute a contract for a new voting system prior to the 2020 General Election. Feb. 21, 2020 Tr. at 16:18-25, 17:1 (Nesmith-Joyner).

279. Provided that a new voting system were able to be procured, the Board would first need to approve that system for use in Philadelphia before it could be implemented. Feb. 21, 2020 Tr. at 31:5-13, 32:1-2 (Lynch).

280. Once a voting system were approved, the Board would then have to undertake all of the same preparation that was completed when transitioning to the ExpressVote XL. Feb. 21, 2020 Tr. at 39:15-40:5 (Lynch).

281. The Board would need to determine if they had the ability to house the new system that was selected, and obtain appropriate storage if necessary. Feb. 21, 2020 Tr. at 39:12-40:1 (Lynch).

282. The Board would also have to undergo the process of training their employees, the public, and the over 8,000 poll workers and interpreters throughout the City. Feb. 21, 2020 Tr. at 40:1-5 (Lynch).

283. If the ExpressVote XL were to be decertified and the machines replaced by ES&S, the City may determine that the machines selected for replacement are not adequate to meet its needs and might procure a new voting system instead. Feb. 19, 2020 Tr. at 336:2-9 (Nesmith-Joyner).

284. During the Procurement Commissioner's time at the Procurement Department there have not been any emergency purchases made. Feb. 19, 2020 Tr. at 338:3-7 (Nesmith-Joyner).

285. The Procurement Commissioner is not aware of any emergency purchase made by the Philadelphia Procurement Department costing \$20 million or more. Feb. 19, 2020 Tr. at 338:21-25, 339:1 (Nesmith-Joyner).

286. Emergency purchases made by the Philadelphia Procurement Department are for much smaller purchases. Feb. 19, 2020 Tr. at 339:2-5 (Nesmith-Joyner).

B. The Philadelphia County Board of Election Does Not Have the Capacity to Transition to a New Voting System Without Risking Chaos, Voter Confusion, or Disenfranchisement

287. The 2020 General Election will be held on November 3, 2020. Fact. Stip. ¶ 96.

288. Prior to the 2020 General Election, the Board must devote time and resources to the 2020 Pennsylvania Primary Election, which will be held on April 28, 2020. Fact. Stip. ¶ 94.

289. The Board processed just 110,470 voter registration applications for the 2019 General Election. Fact. Stip. ¶ 92.

290. During the 2019 General Election, only 304,553 votes were cast in Philadelphia. Fact. Stip. ¶ 89.

291. The Executive Director of the Board, Joseph Lynch, cited this as the reason they chose to transition to a new system in an “off year”. Feb. 21, 2020 Tr. at 29:3-5 (Lynch).

292. In comparison, the Board processed 342,587 voter registration applications for the 2016 General Election, the last presidential election year. Fact. Stip. ¶ 90.

293. The Board also processed 180,713 voter registration applications for the 2018 General Election, the last midterm election year. Fact. Stip. ¶ 91.

294. Due to Act 77, the last day to register to vote for the 2020 General Election is October 19, 2020, just 15 days before the General Election on November 3, 2020. Fact. Stip. ¶ 95; Feb. 18, 2020 Tr. at 125:19-20 (Boockvar).

295. The Board anticipates a high volume of voters and voter registrations for the 2020 presidential election cycle. Feb. 21, 2020 Tr. at 27:10-11 (Lynch).

296. The Board also anticipates that the new requirements of Act 77 will result in a significant increase in the Board's work for the 2020 Primary Election and quadruple the work for the 2020 General Election. Feb. 21, 2020 Tr. at 27:11-14 (Lynch).

297. In order to combat the anticipated increase in volume of voter registrations, and Act 77's shortened timeline to process registrations, the Board plans to reallocate employees to perform this work. Feb. 18, 2020 Tr. at 125:19-20 (Boockvar); Feb. 21, 2020 Tr. at 28:10-12 (Lynch).

298. A similar staff reallocation plan was utilized by the Board in 2019 to transition to the new voting system. Because that reallocation is already occurring in the 2020 election cycle to process voter registrations, it would not be possible for the Board to devote additional employees to transitioning to new voting system. Feb. 21, 2020 Tr. at 28:12-15 (Lynch).

299. Joseph Lynch opined that he did not believe it would be possible to transition to a new voting system in a presidential election year. Feb. 21, 2020 Tr. at 29:3-5 (Lynch)

300. It would be "extremely difficult" for Philadelphia to obtain new voting systems for use in the 2020 general election, and potentially unfeasible. Feb. 18, 2020 Tr. at 124: 3-10, 130:22 (Boockvar). It would not be possible for the City to obtain new voting systems before the April primary elections. Feb. 18, 2020 Tr. at 130:25-131:6 (Boockvar). If required to obtain new voting systems before the November 2020 election, "the immense size of this endeavor [would be] overwhelming" due to the size of the City and the large number of voters, polling precincts, and poll workers. Feb. 18, 2020 Tr. at 124:12-17 (Boockvar).

301. Plaintiffs did not demonstrate that ES&S would indemnify the City if the XL was decertified.

302. At most the evidence shows that there would be a contract dispute between ES&S and the City as to indemnity if the ExpressVote XL is decertified, with no certainty as to the timeline on which that dispute would be resolved.

303. There was no evidence presented that ES&S will indemnify or reimburse other counties if the ExpressVote XL is decertified.

304. If ensuring voting security and integrity is one's goal, one would not favor a requirement that the City must replace its voting machines prior to the 2020 general election.

VIII. Plaintiffs Have Failed to Raise Any Question as to the ExpressVote XL's Reliability

A. Characterization and Features of the ExpressVote XL

305. There are at least two types of ExpressVote machines: the ExpressVote XL and the ExpressVote 2.1. Feb. 19, 2020 Tr. at 58:23-59:6. These machines produce paper records that are identical in format. Feb. 19, 2020 Tr. at 59:18-60:13 (Halderman), 190:6-9 (Baumert).

306. The basic functioning of the ExpressVote XL voting system as certified in Pennsylvania is as follows: voters register votes on a touchscreen; the machine prints a paper ballot with the votes in human-readable text along with corresponding barcodes; the machine scans the barcodes on the paper ballot and records them in its memory; after viewing the paper ballot through a glass pane, the voter chooses to cast or spoil her votes; if the voter casts her votes, the earlier-scanned votes are tabulated and committed to the machine's permanent memory; and the paper ballot passes back through the machine and into the ballot box. Feb. 19, 2020 Tr. at 48: 2-7, 58:10-15 (Halderman), 188:15-189:1, 207:21-212:6 (Baumert).

307. The ExpressVote XL is considered a "hybrid" or "all-in-one" voting machine because it is a single machine that combines two functionalities, a ballot-marking function and a

vote scanning/tabulating function. Feb. 18, 2020 Tr. at 105:1-6 (Boockvar); Feb. 19, 2020 Tr. at 120:1-12 (Halderman), 157: 18-23 (Halderman), 186:22-187:7 (Baumert); JX 8 at 2. This streamlines equipment needs so that polling places need only accommodate a single physical machine for each voting unit and poll workers need only be trained on a single piece of machinery.

308. Although the ExpressVote XL machine has a scanning/tabulating functionality built into it, the same ballot could be scanned by a separate tabulating machine (as part of a recount process or otherwise). Feb. 19, 2020 Tr. 189:2-23 (Baumert).

309. The ExpressVote XL is considered a “universal” voting machine because it is fully accessible to all voters with a full range of capacity, including providing full functionality and accessibility for voters with disabilities. Feb. 19, 2020 Tr. at 187:8-14 (Baumert).

310. Accordingly, a Pennsylvania county can comply with HAVA by using the ExpressVote XL as the sole voting system at each polling location. Feb. 18, 2020 Tr. at 122:11-123:20 (Boockvar); Feb. 19, 2020 Tr. at 193:2-20 (Baumert). This eliminates the burden of training poll workers on two different voting systems. *Id.* Additionally, voters never need to identify themselves to poll workers as having a disability. *Id.*

311. Moreover, ensuring that all voters can vote on the same “universal” voting machine promotes voting secrecy because if only a few voters vote on a polling place’s accessible equipment, poll workers might be able to determine which votes those individuals cast. Feb. 18, 2020 Tr. at 123:3-16 (Boockvar).

312. The ExpressVote XL produces a voter-verifiable paper ballot. Feb. 18, 2020 Tr. at 91:2-17 (Boockvar).

313. The paper ballot is readable behind the glass pane in the ExpressVote XL. Feb. 18, 2020 Tr. at 91:8-14 (Boockgar). *See generally* demonstration of ExpressVote XL voting functionality, *e.g.*, Feb. 19, 2020 Tr. at 210:11-212:6 (Baumert).

314. In Pennsylvania, the human-readable text on the paper ballot produced by the ExpressVote XL is the official vote of record. Feb. 18, 2020 Tr. at 91:14-15 (Boockvar). In the event of a recount, the human-readable text would control. Feb. 18, 2020 Tr. at 115-17 (Boockvar).

315. During an audit, the human-readable text on the paper ballot produced by the ExpressVote XL is counted and compared to the tabulated results from the election. Feb. 18, 2020 Tr. at 91:15-17 (Boockvar); Feb. 19, 2020 Tr. at 75:16-76:12 (Halderman).

316. The ExpressVote XL is a high-quality, modern voting system that has been rigorously examined and evaluated at the federal and state levels multiple times, and approved for use in several states. *See supra ¶¶ 47-49, 51, 54, 202, infra ¶ 322.*

317. At the hearing, Dr. Halderman testified that “knowing everything I know now, I would say that the ExpressVote XL is absolutely a DRE with a VVPAT.” Feb. 19, 2020 Tr. at 6:15-17 (Halderman). The basis for his conclusion, Dr. Halderman testified, was that the ExpressVote XL is a hybrid machine, which both casts and tabulates votes, and that the ballot it produces is “captive behind the pane of glass.” *Id.* at 6:19-7:7.

318. Dr. Halderman’s testimony that an ExpressVote XL is a DRE with VVPAT was not plausible. Dr. Halderman acknowledged that a defining characteristic of DREs is that they record votes electronically on electronic media; they do not record votes on paper or tabulate votes by scanning that paper. Feb. 19, 2020 Tr. at 8:20-25, 10:16-21. He acknowledged that the

ExpressVote XL records votes on paper and tabulates them by scanning that paper, but insisted that the difference was a mere “engineering detail.” *Id.* at 9:12-10:14.

319. Dr. Halderman’s testimony on this subject, like his testimony generally, was not credible. When pressed, Dr. Halderman admitted that the defining feature of a DRE machine – as reflected by the acronym, which stands for “direct-recording electronic” – is that the vote is cast by recording the voter’s electronic selections directly into the machine’s electronic memory.

Feb. 18, 2020 Tr. 62:20-63:2 (Boockvar); Feb. 19, 2020 Tr. 10:16-19 (Halderman); Feb. 19, 2020 Tr. 187:21-188:4 (Baumert). A VVPAT receipt is merely a paper receipt of what was directly recorded in that electronic memory; as Dr. Halderman was ultimately forced to concede, a DRE with VVPAT does not scan the receipt to tabulate the vote. Feb. 19, 2020, Tr. 8:20-25, 10:16-19 (Halderman); Feb 19, 2020 Tr. 188:5-14 (Baumert). In stark contrast, the ExpressVote XL does not tabulate the vote by directly recording the voter’s selections into electronic memory; it prints the voter’s selections on a paper ballot and – after the voter has had an opportunity to review and verify the paper – scans the paper to tabulate the vote. Feb. 19, 2020, Tr. 9:24-10:14 (Halderman); Feb. 19, 2020 Tr. 188:15-189:1 (Baumert). Furthermore, and also in contrast to VVPAT receipts, the votes recorded on the XL’s paper records can be scanned and tabulated on separate scanning machines, for example, as part of a recount. Feb. 19, 2020 Tr. 189:2-23 (Baumert). Reflecting this fundamental difference, the EAC’s description of the ExpressVote XL expressly distinguishes it from a DRE. JX 28, at 2 of 15 (juxtaposing descriptions of “ExpressVote XL” and “ExpressTouch”).

320. Dr. Halderman’s newfound insistence that the ExpressVote XL should be characterized as a DRE with a VVPAT is also diametrically at odds with the position he took

during the parties' settlement discussions. As previously noted, Plaintiffs were intent at that time on ensuring that Pennsylvania would not certify any DREs, including DREs with VVPATs. For example, Plaintiffs brought with them to the October 11, 2018 settlement conference a draft term sheet specifying that “[a] VVPAT receipt generated by a DRE machine” would not satisfy the proposed settlement. JX 24, at 1 n.1. Yet in his feedback on the ExpressVote machines, including the XL, which was provided to Defendants on October 9, 2018, Dr. Halderman nowhere suggested that they were DREs with VVPATs. *See* JX 20. Dr. Halderman was plainly aware at that time of the XL features that he now claims make the XL a DRE with a VVPAT (*see* Feb. 19, 2020 Tr. 8:5-18 (Halderman)); in July 2018, he had visited ES&S's headquarters, where he operated a ExpressVote XL machine, had it demonstrated to him, and reviewed the format of the paper records it creates. Feb. 19, 2020 Tr. 103:13-105:5 (Halderman).

321. In sum, Dr. Halderman's testimony that the ExpressVote XL is a DRE with a VVPAT receipt lacks all credibility and is contradicted by the overwhelming weight of the evidence.

B. Use of ExpressVote XL Nationally

322. The ExpressVote XL has been certified for use in six states. Feb. 19, 2020 Tr. at 223:2-9 (Baumert).

323. The ExpressVote XL has been used in more than 10 elections. Feb. 19, 2020 Tr. at 224:17-24 (Baumert).

C. The ExpressVote XL Is a Secure Voting System

1. Plaintiffs Presented No Evidence That the ExpressVote XL Can Plausibly Be Compromised

324. Plaintiffs presented no evidence that the ExpressVote XL has been hacked in any real-world situation.

325. Plaintiffs presented no evidence of any testing of the ExpressVote XL that has demonstrated that it can be hacked.

326. In Pennsylvania the ExpressVote XL is certified to be configured so that there is no space left between votes on the paper ballot, including where a voter chooses not to make a selection in a particular race. Feb. 19, 2020 Tr. at 77:12-79:1 (Halderman).

327. Plaintiffs presented no evidence that any testing has been done that has demonstrated that their theories as to ways in which the XL could potentially be hacked are correct.

328. Plaintiffs presented no evidence that the ExpressVote XL is any more vulnerable to hacking than any other voting system.

329. Plaintiffs presented no evidence that in any election or in testing the ExpressVote XL has ever produced paper records with barcodes that did not match the human-readable text. Feb. 18, 2020 Tr. at 157:6-10 (Boockvar); Feb. 19, 2020 Tr. at 66:8-16, 67:15-68:12, 69:18-22 (Halderman).

330. Plaintiffs presented no evidence that the ExpressVote XL can plausibly be hacked to print barcodes that do not match up with the human-readable text on the paper ballot.

331. If the barcodes printed on the ExpressVote XL paper ballot did not match the human-readable text, it would be caught in an audit. Feb. 18, 2020 Tr. at 91:15-17 (Boockvar); Feb. 19, 2020 Tr. at 75:16-76:12 (Halderman), Feb. 19, 2020 Tr. at 237:14-238:17 (Baumert).

332. Plaintiffs presented no evidence that in any election or in testing the ExpressVote XL has ever been hacked causing space to be left between votes printed on the paper ballots. Feb. 19, 2020 Tr. at 80:9-15 (Halderman).

333. Plaintiffs presented no evidence that the ExpressVote XL can plausibly be hacked to leave space between the votes printed on the paper ballot.

334. Plaintiffs presented no evidence that the ExpressVote XL has ever been subject to hacking or malware that has caused votes that have been rejected by voters to be recorded and tabulated in any election or in testing. Feb. 19, 2020 Tr. at 82:2-11 (Halderman). Testimony to this effect was purely speculative.

335. Plaintiffs presented no evidence that it is plausible that the ExpressVote XL could be subject to hacking or malware that could cause votes that have been rejected by voters to be recorded and tabulated.

336. If the ExpressVote XL was subject to hacking or malware that caused votes that have been rejected by voters to be recorded and tabulated, it would be caught in an audit. Feb. 19, 2020 Tr. at 82:12-83:8 (Halderman), 250:2-22 (Baumert).

337. Plaintiffs presented no evidence that, if the ExpressVote XL could tabulate a rejected ballot, that would constitute a violation of the Settlement Agreement.

338. Dr. Halderman lacked credibility in asserting theories about the vulnerabilities of the XL without having tested those theories and without any knowledge that the machine has ever been compromised in the ways he asserts are possible.

339. As in prior proceedings in this case, the Court finds that Dr. Halderman has asked the Court to accept academic speculation about potential security flaws at face value, without a shred of evidence that these problems have ever appeared in real-world settings or have any reasonable possibility of doing so.

340. The credibility of Dr. Halderman's testimony must be discounted even further based on his equivocation regarding certain important historical facts (*see, e.g.*, Feb. 19, 2020 Tr. at 95:13-17, 99:15-100:20); his apparent failure to investigate information about the ExpressVote machines that was readily available to him at the time he was purportedly assessing the machine as Plaintiffs' voting-system expert at the time of the settlement discussions (*see, e.g., id.* at 88:21-89:10, 90:15-92:11, 100:3-19, 121:25-123:6); and his utterly implausible attempts to explain away his and his mentor Dr. Appel's repeated descriptions of the XL's paper records as "ballots" and "paper ballots" (*see, e.g., id.* at 53:11-19, 123:17-25, 125:12-126:24, 131:23-134:16).

2. The ExpressVote XL Has Several Built-In and Extrinsic Security Features

341. The printhead in the ExpressVote XL lifts when it is not in operation so that the paper can pass by it to be deposited in the ballot box. Feb. 19, 2020 Tr. at 219:16-220:17 (Baumert).

342. When a vote is spoiled the paper ballot is ejected from the front of the ExpressVote XL and the vote data in the machine's memory is automatically erased. Feb. 19, 2020 Tr. at 216:5-19 (Baumert).

343. There is a specialized barrel key used to open the ExpressVote XL voting systems for use. Feb. 19, 2020 Tr. at 192:12-193:1 (Baumert).

344. Security passcodes are required to turn on the ExpressVote XL voting systems for use. Feb. 19, 2020 Tr. at 196:14-18 (Baumert).

345. A specialized USB, which is physically particular to the ExpressVote XL and which uses encrypted passcodes, is used to load the election-specific media onto the ExpressVote XL voting systems for a particular election via a USB port that is located under a locked panel. Feb. 19, 2020 Tr. at 196:19-199:14 (Baumert).

346. The ExpressVote XL uses specially encrypted barcodes to encode vote data. Feb. 19, 2020 Tr. at 243:22-244:9 (Baumert).

347. The ExpressVote XL paper ballots are printed without any space between votes, and prints "no selection" where a voter has not made a selection in a given race. Feb. 19, 2020 Tr. at 244:10-245:1 (Baumert).

348. It would be extremely difficult to print additional symbols or text onto the paper ballot produced by the ExpressVote XL after it has been presented to the voter for verification,

on its way back through the machine to be deposited in the ballot box due to the mechanical functioning of the printer, including different speed and alignment of the paper as it moves back through the machine compared to while it is printing. Feb. 19, 2020 Tr. at 245:6-246:15 (Baumert).

349. The ExpressVote XL machines store votes registered on the touchscreen in temporary memory and then compare that record against the printed and scanned paper ballot record when votes are cast; if there is a discrepancy, the ballot is rejected. Feb. 19, 2020 Tr. at 277:16-279:15 (Baumert).

350. A system of numbered plastic seals is used to ensure that when an ExpressVote XL voting system is put into use on a given election day it has not been tampered with by any unauthorized persons. Feb. 19, 2020 Tr. at 191:18-192:11, 202:21-23 (Baumert).

351. The 3,750 ExpressVote XL voting machines that were shipped by ES&S to the City of Philadelphia all arrived in tractor trailers sealed with an aluminum seal. Each seal was individually numbered, and this number was recorded by Board staff upon arrival. Feb. 21, 2020 Tr. at 43:12-15, 44:20-21 (Lynch).

352. Upon arrival, each machine was visually checked for damage. User acceptance testing was then performed by the Board on every machine to ensure it was functioning properly. The machines were locked up by the Board at the storage warehouse. Feb. 21, 2020 Tr. at 45:12-18 (Lynch).

353. Before the voting machines are used to vote, Board technicians perform a Logic and Accuracy test on each machine to confirm that every vote selection is being accurately recorded. Once the machine successfully passes this test the Board technicians install a unique

plastic numeric seal on the machine. This number is then recorded by the technician. Feb. 21, 2020 Tr. at 44:6-14, 46:4-7 (Lynch).

354. The voting machines remain sealed until election day when they are opened for the polls. The machines can only be opened by breaking the seal. Feb. 21, 2020 Tr. at 43:25, 44:1-2, 51:5-6, 51:16-19 (Lynch).

355. On election day the judges of elections are required to record the seal number in their materials to be returned to the Board. If a judge of elections discovers that any seal is broken, they are required to notify Board staff. Feb. 21, 2020 Tr. at 46:8-12, 51:13-15 (Lynch).

356. There were no reports of any broken seals in the November 2019 General Election in the City of Philadelphia. Feb. 21, 2020 Tr. at 46:13-15 (Lynch).

357. There is no evidence of any security flaws or particular vulnerabilities at the ES&S facility.

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CERTIFICATE OF SERVICE

I hereby certify that on March 16, 2020, I caused the foregoing Defendants' Defendants' and Intervenors' Proposed Findings of Fact to be filed with the United States District Court for the Eastern District of Pennsylvania via the Court's CM/ECF system, which will provide electronic notice to all counsel of record.

/s/ Mark A. Aronchick

Mark A. Aronchick